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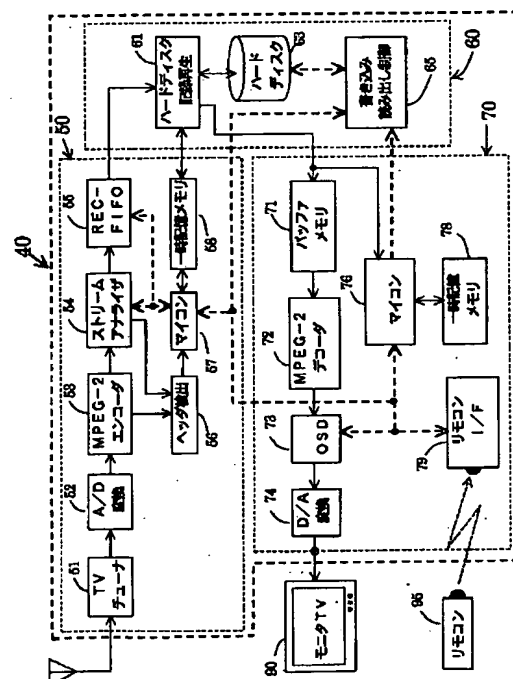
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(54)【発明の名称】 映像信号の記録方法、及び映像信号記録装置

(57)【要約】

【課題】 符号化した映像信号をランダムアクセス可能な記録媒体に記録するに際し、ストリーム領域への記録エラー、及び管理データ領域への記録エラーに対しても記録動作を継続する映像信号記録装置を実現することにある。

【解決手段】 符号化された映像信号の記録は符号化装置53により生成された符号化信号を一時記憶手段55に一時記憶した後に記録媒体63のストリーム領域に記録するようにし、記録媒体にエラーが検出された時は一時記憶手段55に記憶される符号化信号を消去して後に、記録のための信号処理を再開するようにし、又管理データ記録時に生じる管理データ領域での記録エラーはエラー領域の自動交替処理を行って後に一時記憶手段55の符号化信号を消去し、記録信号処理を再開するようにして記録中断時間の短い映像信号記録装置を実現した。



**【特許請求の範囲】**

【請求項1】供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号を一時記憶し、一時記憶されたその符号化信号を読み出してランダムアクセス可能な記録媒体に記録する映像信号の記録方法において、前記符号化信号を前記記録媒体に記録するときに生じる誤り信号を検出する第1のステップと、その第1のステップにより誤り信号が検出されるときは、前記一時記憶された符号化信号を消去する第2のステップと、その第2のステップによる消去後に、前記供給される符号化信号の一時記憶を開始する第3のステップと、その第3のステップにより一時記憶された信号を、前記所定の画像単位毎に読み出す第4のステップと、その第4のステップにより読み出された所定の画像単位ごとの信号を前記記録媒体に記録する第5のステップと、を少なくとも有することを特徴とする映像信号の記録方法。

【請求項2】供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号に関する符号化情報、及びその符号化信号の記録順に関する情報を含む管理データ信号を生成し、その生成された管理データ信号及び前記符号化信号のそれぞれを一時記憶し、一時記憶されたそれらの信号を読み出してランダムアクセス可能な記録媒体のそれぞれの記録領域に記録する映像信号の記録方法において、前記符号化信号を前記記録媒体に記録するときに生じる誤り信号を検出する第1のステップと、その第1のステップにより誤り信号が検出されるときは、前記一時記憶された符号化信号を消去する第2のステップと、その第2のステップにより符号化信号が消去された後に、前記供給される符号化信号を一時記憶する第3のステップと、その第3のステップにより一時記憶された信号を、前記所定の画像単位毎に読み出す第4のステップと、その第4のステップにより読み出された所定の画像単位ごとの信号を前記記録媒体に記録する第5のステップと、前記第5のステップにより、最初に読み出された所定の画像単位は、不連続な画像単位の水データであることを示すフラグを含む前記管理データ信号を記録媒体に記録する第6のステップと、を少なくとも有することを特徴とする映像信号の記録方法。

【請求項3】供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号を一時記憶すると共に、その得られた符号化信

号を記録媒体に記録して再生するための管理データを生成し、その生成された管理データ及び前記一時記憶された符号化信号をランダムアクセス可能な記録媒体に記録する映像信号の記録方法において、前記管理データを前記記録媒体に記録するときに生じる誤り信号を検出する第1のステップと、その第1のステップにより誤り信号が検出されたときは、管理データ書き込みの自動交替処理を行うと共に、前記一時記憶された符号化信号を消去する第2のステップと、その第2のステップによる自動交替処理、及び符号化信号の消去がなされた後に、前記供給される符号化信号を一時記憶する第3のステップと、その第3のステップにより一時記憶された信号を、前記所定の画像単位毎に読み出す第4のステップと、その第4のステップにより読み出された信号を前記記録媒体に記録する第5のステップと、を少なくとも有することを特徴とする映像信号の記録方法。

【請求項4】供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号を所定の記録領域毎に記録、及び再生時のデータ誤り率を管理データとして得、その得られた管理データに基づいた記録領域に前記符号化信号を記録する映像信号の記録方法において、前記記録媒体に前記符号化信号が所定時間書き込み、又は読み出しのなされない記録又は再生の非動作状態を検出する第1のステップと、その第1のステップにより非動作状態が検出されたときは、過去にデータ誤り率が大きであるとされた記録領域を含めて記録時のデータ誤り率を検査する第2のステップと、その第2のステップによりデータ誤り率が小であるとされた記録領域を記録許可とする前記管理データを生成する第3のステップと、を少なくとも有することを特徴とする映像信号の記録方法。

【請求項5】供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号を一時記憶手段に一時記憶し、一時記憶されたその符号化信号を読み出してランダムアクセス可能な記録媒体に記録する映像信号記録装置において、前記符号化信号を前記記録媒体に記録するときに生じる誤り信号を検出する誤り信号検出手段と、その誤り信号検出手段により誤り信号が検出されるときは、前記一時記憶された符号化信号を消去する一時記憶消去手段と、その一時記憶消去手段による消去後に、前記供給される符号化信号の一時記憶を開始する一時記憶手段と、その一時記憶手段に一時記憶された信号を前記所定の画

像単位毎に読み出し、読み出して得られる信号を前記記録媒体に記録する信号記録手段と、  
を具備して構成することを特徴とする映像信号記録装置。

【請求項6】 供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号を一時記憶手段に一時記憶し、一時記憶されたその符号化信号を読み出してランダムアクセス可能な記録媒体に記録する映像信号記録装置において、  
所定の記憶容量を有する前記一時記憶手段に記憶される符号化信号の記憶量を検査し、その符号化信号の供給が記憶容量を超えてなされるときにオーバーフロー信号を供給するオーバーフロー検出手段と、  
そのオーバーフロー検出手段によりオーバーフロー信号が供給されるときは前記一時記憶手段への符号化信号の供給を停止する供給信号停止手段と、  
前記オーバーフロー検出手段によりオーバーフロー信号が供給されるときは前記一時記憶手段に記憶されている符号化信号を消去する一時記憶消去手段と、  
を具備して構成することを特徴とする映像信号記録装置。

【請求項7】 供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号に関する符号化情報、及びその符号化信号の記録順に関する情報を含む管理データ信号を生成し、その生成された管理データ信号及び前記符号化信号のそれぞれを一時記憶し、一時記憶されたそれらの信号を読み出してランダムアクセス可能な記録媒体のそれぞれの記録領域に記録する映像信号記録装置において、  
所定の記憶容量を有する前記一時記憶手段に記憶される符号化信号の記憶量を検査し、その符号化信号の供給が記憶容量を超えてなされるときにオーバーフロー信号を供給するオーバーフロー検出手段と、  
前記オーバーフロー検出手段によりオーバーフロー信号が供給されるときは前記一時記憶手段に記憶されている符号化信号を消去する一時記憶消去手段と、  
前記オーバーフロー検出手段によりオーバーフロー信号が供給されるとき、前記符号化信号は不連続な画像単位から開始されることを示すフラグを含む前記管理データを生成する管理データ生成手段と、  
を具備して構成することを特徴とする映像信号記録装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、TV放送を受信して得られる映像、及び音声信号を圧縮符号化された信号としてハードディスクなどの記録媒体に記録する映像信号の記録方法、及び映像信号記録装置に関する。

【0002】

【従来の技術】 記録媒体としてハードディスクなどのラ

ンダムアクセス可能な記録媒体を用いた映像信号記録装置は、記録のためのアクセス時間が短いため、複数のTV放送番組を同時に記録できる、また映像信号の記録と再生を同時に行うことが出来るなどの機能を有している。

【0003】そして、このような同時記録再生機能を有する映像信号記録装置は、放送中の番組を現在から過去に連続的にタイムシフトしながら視聴できるキャッシュ記録再生、及び過去に記録を開始した番組を現在記録中の番組に追いつく様に再生する追っかけ再生ができるなど便利な記録機能を有しており、今後、従来のタイムシフトマシンとして利用されているVTRと共に家庭に導入されていくものと考えられている。

【0004】そして、従来のVTRにおける記録信号のモニタは、VTRに供給される記録用信号を直接モニタTVに供給して視聴するようになされており、そのモニタ映像は記録回路の途中にある信号のモニタはできるが、実際にどのように記録媒体に記録されているか、そしてその記録映像の画質異常、又は何らかの原因により記録がなされない状態であるかなどを知ることはできない。

【0005】それに対し、同時記録再生機能を有する映像信号記録装置では、記録中の映像をリアルタイムで再生しながら記録された信号の確認を行えるため、記録時の不具合に関してもその時に知ることができ、記録ミスを最低限におさえることができるなどの特徴を有している。

【0006】さらに、記録中に、再度視聴したい映像、または見逃した映像があるときは、記録を継続しながら簡易な操作により過去の映像を視聴できるなど、ハードディスクを用いて行う記録、及び再生の機能は視聴者にとって便利な機能であり、そのような記録機能を搭載したPVR (personal video recorder) も開発されている。

【0007】

【発明が解決しようとする課題】 ところで、ハードディスクを記録媒体として用いる映像信号記録装置では、記録媒体のランダムアクセス性が優れていることによりVTRが有しない記録、及び記録再生機能を有する映像信号記録装置を構成することができるが、その記録媒体であるハードディスクはコンピュータ用周辺機器として開発されたものを用いるときは、連続して供給される大量の映像データを記録する映像信号記録装置として動作させることとなり、その装置を構成するためにいくつかの課題があるが、その代表的なものを以下に示す。

【0008】まず、符号化された映像信号を記録し、その記録された映像信号の再生を行うときに、論理セクタ、ないしはクラスタに分割されて記録される符号化された映像信号をスムーズな映像信号として表示するためにも所定の速度で書き込み、及び読み出しを行う必要が

有るが、特にその映像信号の高速再生映像を得ようとするときはその再生速度に応じて更に多量の符号化信号の書き込み、及び読み出しを行う必要があり、そのような高速再生映像信号の再生を高価でない通常の読み出し速度を有するハードディスクに対し、実質的に高速な符号化信号の読み出しが出来る必要があり、そのための動作速度の改善が必要である。

【0009】そして、ハードディスクなどの記録媒体では、その信号記録面におけるデフェクトなどの影響により記録した映像信号に誤り信号が含まれることがあり、その誤り信号が生じるとき、従来のコンピュータ用の記憶装置では、例えば10回の繰り返し再生を行うことにより誤り信号の含まれない再生信号を得るリトライ動作がなされている。

【0010】しかし、映像信号の再生の場合は連続した読み出し動作が必要であるため、ハードディスクを多数回繰り返し記録、ないしは再生動作を行なうことは映像信号の破綻の原因となる等映像を視聴する上で好ましくなく、記録媒体のデフェクトに対する誤り信号処理のための動作時間を縮小する必要があり、それを解決する必要がある。

【0011】さらに、映像信号記録装置において記録媒体に記録する信号には、符号化された映像信号と、その符号化された映像信号の管理データとがあるが、これらの信号のデータ誤りに対する影響の度合いが異なっており、記録媒体上ではそれぞれの信号のために異なる領域を設定して記録を行うようにしている。

【0012】特に、管理データ記録領域においてライトエラーが生じたときはそのエラー処理に長い時間を要し、そのため記録機能が停止されるが、そのエラー処理終了後に記録を再開するための処理方法が必要であり、その解決が求められている。

【0013】そこで本発明は、ハードディスクなどのランダムアクセス性の優れた記録媒体を用いる映像信号の記録装置において、記録した映像信号の高速再生に対しても十分な再生速度を有する符号化信号を生成すると共に、特に媒体のデフェクトに基づく誤り信号に対しても記録機能が停止するような影響の受け難い記録動作、そして2種類の誤り耐性の異なる信号を記録媒体に記録する方法、及びそのための装置の構成に関する解決手段を示し、コンピュータ用として実現されたハードディスクなどの記録媒体を用いる映像信号の記録を、従来のVTRが有する記録機能に比し、同時記録再生、及び高速再生など好ましい記録、再生特性を有すると共に、記録媒体のデフェクトに起因して生じる誤り信号の影響を受け難い映像信号の記録方法、及び映像信号記録装置の構成を提供しようとするものである。

【0014】

【課題を解決するための手段】本発明の映像信号の記録方法、及び映像信号記録装置は、上記課題を解決するた

めに以下の1)～7)の手段より成るものである。すなわち、

【0015】1) 供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号を一時記憶し、一時記憶されたその符号化信号を読み出してランダムアクセス可能な記録媒体に記録する映像信号の記録方法において、前記符号化信号を前記記録媒体に記録するときに生じる誤り信号を検出する第1のステップ(63、61)と、その第1のステップにより誤り信号が検出されるときは、前記一時記憶された符号化信号を消去する第2のステップ(57、55)と、その第2のステップによる消去動作の後に、前記供給される符号化信号の一時記憶を開始する第3のステップ(57、54、55)と、その第3のステップにより一時記憶された信号を、前記所定の画像単位毎に読み出す第4のステップ(55、61)と、その第4のステップにより読み出された所定の画像単位ごとの信号を前記記録媒体に記録する第5のステップ(61、63)と、を少なくとも有することを特徴とする映像信号の記録方法。

【0016】2) 供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号に関する符号化情報、及びその符号化信号の記録順に関する情報を含む管理データ信号を生成し、その生成された管理データ信号及び前記符号化信号のそれぞれを一時記憶し、一時記憶されたそれらの信号を読み出してランダムアクセス可能な記録媒体のそれぞれの記録領域に記録する映像信号の記録方法において、前記符号化信号を前記記録媒体に記録するときに生じる誤り信号を検出する第1のステップ(63、61)と、その第1のステップにより誤り信号が検出されるときは、前記一時記憶された符号化信号を消去する第2のステップ(57、55)と、その第2のステップにより符号化信号が消去された後に、前記供給される符号化信号を一時記憶する第3のステップ(57、54、55)と、その第3のステップにより一時記憶された信号を、前記所定の画像単位毎に読み出す第4のステップ(55、61)と、その第4のステップにより読み出された所定の画像単位ごとの信号を前記記録媒体に記録する第5のステップ(61、63)と、前記第5のステップにより、最初に読み出された所定の画像単位は、不連続な画像単位のデータであることを示すフラグを含む前記管理データ信号を記録媒体に記録する第6のステップ(57、58、61、63)と、を少なくとも有することを特徴とする映像信号の記録方法。

【0017】3) 供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号を一時記憶すると共に、その得られた符号化信号を記録媒体に記録して再生するための管理データを生成し、その生成された管理データ及び前記一時記

憶された符号化信号をランダムアクセス可能な記録媒体に記録する映像信号の記録方法において、前記管理データを前記記録媒体に記録するときに生じる誤り信号を検出する第1のステップ(63、61)と、その第1のステップにより誤り信号が検出されたときは、管理データ書き込みの自動交替処理を行うと共に、前記一時記憶された符号化信号を消去する第2のステップ(63、61、57、55)と、その第2のステップによる自動交替処理、及び符号化信号の消去がなされた後に、前記供給される符号化信号を一時記憶する第3のステップ(57、54、55)と、その第3のステップにより一時記憶された信号を、前記所定の画像単位毎に読み出す第4のステップ(55、61)と、その第4のステップにより読み出された信号を前記記録媒体に記録する第5のステップ(61、63)と、を少なくとも有することを特徴とする映像信号の記録方法。

【0018】4) 供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号を所定の記録領域毎に記録、及び再生時のデータ誤り率を管理データとして得、その得られた管理データに基づいた記録領域に前記符号化信号を記録する映像信号の記録方法において、前記記録媒体に前記符号化信号が所定時間書き込み、又は読み出しのなされない記録又は再生の非動作状態を検出する第1のステップ(65、57)と、その第1のステップにより非動作状態が検出されたときは、過去にデータ誤り率が大であるとされた記録領域を含めて記録時のデータ誤り率を検査する第2のステップ(61、63)と、その第2のステップによりデータ誤り率が小であるとされた記録領域を記録許可とする前記管理データを生成する第3のステップ(57)と、を少なくとも有することを特徴とする映像信号の記録方法。

【0019】5) 供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号を一時記憶手段に一時記憶し、一時記憶されたその符号化信号を読み出してランダムアクセス可能な記録媒体に記録する映像信号記録装置において、前記符号化信号を前記記録媒体に記録するときに生じる誤り信号を検出する誤り信号検出手段(63、61)と、その誤り信号検出手段により誤り信号が検出されるときは、前記一時記憶された符号化信号を消去する一時記憶消去手段(57、55)と、その一時記憶消去手段による消去後に、前記供給される符号化信号の一時記憶を開始する一時記憶手段(57、54、55)と、その一時記憶手段に一時記憶された信号を前記所定の画像単位毎に読み出し、読み出して得られる信号を前記記録媒体に記録する信号記録手段(55、61、63)と、を具備して構成することを特徴とする映像信号記録装置。

【0020】6) 供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得ら

れた符号化信号を一時記憶手段に一時記憶し、一時記憶されたその符号化信号を読み出してランダムアクセス可能な記録媒体に記録する映像信号記録装置において、所定の記憶容量を有する前記一時記憶手段に記憶される符号化信号の記憶量を検査し、その符号化信号の供給が記憶容量を超えてなされるときにオーバーフロー信号を供給するオーバーフロー検出手段(55、57)と、そのオーバーフロー検出手段によりオーバーフロー信号が供給されるときは前記一時記憶手段への符号化信号の供給を停止する供給信号停止手段(57、54)と、前記オーバーフロー検出手段によりオーバーフロー信号が供給されるときは前記一時記憶手段に記憶されている符号化信号を消去する一時記憶消去手段(57、55)と、を具備して構成することを特徴とする映像信号記録装置。

【0021】7) 供給される映像信号を所定の画像単位ごとの圧縮符号化した符号化信号として得、その得られた符号化信号に関する符号化情報、及びその符号化信号の記録順に関する情報を含む管理データ信号を生成し、その生成された管理データ信号及び前記符号化信号のそれぞれを一時記憶し、一時記憶されたそれらの信号を読み出してランダムアクセス可能な記録媒体のそれぞれの記録領域に記録する映像信号記録装置において、所定の記憶容量を有する前記一時記憶手段に記憶される符号化信号の記憶量を検査し、その符号化信号の供給が記憶容量を超えてなされるときにオーバーフロー信号を供給するオーバーフロー検出手段(55、57)と、前記オーバーフロー検出手段によりオーバーフロー信号が供給されるときは前記一時記憶手段に記憶されている符号化信号を消去する一時記憶消去手段(57、55)と、前記オーバーフロー検出手段によりオーバーフロー信号が供給されるとき、前記符号化信号は不連続な画像単位から開始されることを示すフラグを含む前記管理データを生成する管理データ生成手段(57)と、を具備して構成することを特徴とする映像信号記録装置。

【0022】

【発明の実施の形態】以下、本発明の映像信号の記録方法、及び映像信号記録装置の実施の形態につき、その記録した信号を再生するための映像信号再生装置を含む好ましい実施例を示して説明する。図1に、そのハードディスクに映像信号を記録し、再生する映像信号記録再生装置の概略ブロック図を示し、その構成と通常記録、再生時の動作について概説する。

【0023】同図に示す映像信号記録再生装置40は記録部50、媒体部60、及び再生部70よりなり、再生部70にはモニタTV90が有線により接続され、そして記録部50、及び再生部70に対してなされる操作はリモコン95により、視聴者によりなされる操作内容が赤外線により再生部70に向けて伝送されるようになっている。

【0024】まず、記録部50はTVチューナ51、A

／D変換器52、MPEG-2エンコーダ53、ストリームアナライザ54、REC-FIFO55、ヘッダ検出器56、マイコン57、及び一時記憶メモリ58より構成される。

【0025】そして、媒体部60はハードディスク記録再生器61、ハードディスク63、及び書き込み読み出し制御器65より、また再生部70はバッファメモリ71、MPEG-2デコーダ72、OSD73、D/A変換器74、マイコン76、一時記憶メモリ78、及びリモコンインタフェース79より構成される。

【0026】次に、この様に構成される映像信号記録再生装置40の動作について概説する。まず、TVチューナ51はアンテナより入来する放送電波の内、リモコン95などにより設定される受信チャンネルの映像信号が受信され、受信して得られるビデオ信号はA/D変換器52に供給されてデジタル信号に変換されてMPEG-2エンコーダ53に供給される。

【0027】そのMPEG-2エンコーダ53では、供給された映像信号はISO/IEC (International Organization for Standardization / International Electrotechnical Commission) で定められたMPEG-2 (moving picture experts group - 2) 標準規格に従って圧縮符号化され、その圧縮符号化された信号はストリームアナライザ54、及び後述のヘッダ検出器56に供給される。

【0028】そのストリームアナライザ54では、圧縮符号化された信号の形式が解析され、解析して得られる符号化情報信号、及び供給された符号化信号はREC-FIFO55に供給される。

【0029】REC-FIFO55は記録 (REC: recording) 用信号のFIFO (first in first out) 動作、即ち供給される入力信号を一時記憶し、入力された順にその信号を出力信号として供給する回路で、この回路より供給された信号はハードディスク記録再生器61に供給される。

【0030】そのハードディスク記録再生器61では、供給された信号はハードディスク63に記録するためのセクタサイズごとに分割された信号とされ、その分割された信号は書き込み読み出し制御器65により動作制御されるハードディスク63に供給され、供給された信号はハードディスク63の図示しない円盤状記録媒体の所定のセクタ領域に記録される。

【0031】そして、前述のヘッダ検出器56には、MPEG-2で符号化された信号より、例えばGOP (Group of Picture) のデータ構成に関わる符号化情報が供給され、その供給された符号化情報はマイコン57に供給される。

【0032】そのマイコン57では、供給された符号化情報を基にハードディスク63における情報の記録、及び再生をスムーズに行うためのハードディスク管理情報

(以下、管理データと記すこともある) が生成され、その生成された管理情報は一時記憶メモリ58に一時記憶され、一時記憶されたハードディスク管理情報は適宜ハードディスク記録再生器61を介してハードディスク63の所定の領域に記録される。

【0033】このようにして、受信されるチャンネルのビデオ信号、及び上述のハードディスク管理情報はハードディスク63に記録されるが、その供給されて記録されるビデオ信号が、例えばVTRなどの他の記録メディアに記録された信号であるときで、その信号がアナログ信号の場合は、そのビデオ信号はA/D変換器52に供給されて、同様の処理がなされてハードディスク63に記録される。

【0034】また、記録されるビデオ信号が、例えばBSデジタル放送、及びデジタル地上放送など、予めMPEG-2などの方式により符号化された信号であるときは、その符号化された信号はMPEG-2エンコーダを介さずに直接ストリームアナライザ54、及びヘッダ検出器56に供給され、同様の信号処理がなされてハードディスク63に記録される。

【0035】なお、MPEG-2エンコーダ53がGOPの構成等に関する符号化情報を供給できる機能を有しているとき、あるいはデジタル放送などでGOPなどの符号化情報が補助情報等により供給されるとき、その情報はヘッダ検出器56に供給され、ヘッダ検出器56ではその情報を基に符号化情報を含む管理情報が生成されてマイコン57に供給されるようにしてもよい。

【0036】この様にしてアナログTV放送、デジタルテレビ放送、又は他の記録媒体に記録された映像信号は圧縮符号化されたビデオ信号とされ、そのビデオ信号は管理情報と共にハードディスク63に記録される。

【0037】次に、この様にして記録されたハードディスク63の記録信号の再生動作について概説する。まず、リモコン95により再生ボタンが操作されたときは、その操作内容は変調された赤外光線によりリモコンインタフェース79に伝送され、リモコンキーの操作内容はマイコン76に供給される。

【0038】そのマイコン76からは、操作内容に応じて生成された制御信号が書き込み読み出し制御回路65に供給され、書き込み読み出し制御器65によりハードディスク63は制御され、ハードディスク63は指定された個所の信号を読み出し、読み出された信号はハードディスク記録再生器61に供給される。

【0039】そのハードディスク記録再生器61ではハードディスク63より読み出された信号の増幅、特性の補正、及び再生された誤り信号の検出などが行われ、そのような信号処理のなされた信号はバッファメモリ71に供給される。

【0040】バッファメモリ71では、圧縮符号化された信号は一時記憶され、MPEG-2デコーダからの要

求に応じて一時記憶された信号は読み出されてそのMPEG-2デコーダ72に供給される。

【0041】そのMPEG-2デコーダ72では、供給された信号はMPEG-2標準に従い、エンコーダ53で圧縮符号化されたと相補的な方法によりデコードされ、デコードされて得られたデジタルビデオ信号は必要に応じて、例えばキャッシュ録再中である等の情報がOSD (On Screen Display) 73により表示機に表示される表示信号が多重され、表示信号の多重されたデジタル映像信号はD/A変換器74に供給されてアナログビデオ信号に変換され、変換されたアナログビデオ信号はモニタTV90に供給されて、表示される。

【0042】なお、ここでOSD73に多重される表示信号は、OSD73に内蔵される図示しないビデオRAMに蓄えられている信号、ないしは一時記憶メモリ78に記憶される表示内容情報がマイコン76を介してOSD73に供給され、そのOSD73に供給された情報を基に生成された表示信号はMPEG-2デコーダ72から供給される映像信号に多重されて表示される。

【0043】このようにして、供給されるビデオ信号はMPEG-2方式により、フレーム内圧縮、及び動き補償技術が用いられてエンコードされるフレーム間圧縮された信号とされ、それらの信号がハードディスク63に記録される。そして、ハードディスク63に記録された信号は読み出されてMPEG-2デコーダによりデコードされるが、次にその様になされるMPEG-2方式により符号化される画像信号について述べる。

【0044】図2に、MPEG-2方式により扱われる画像の種類を示す。同図において、ビデオ信号を構成するフレーム画像（ピクチャ）にI、B、Pの名前がつけられて時間方向に並べられているが、そのIはフレーム内符号化のなされるI (Intra-coded) フレーム（ピクチャ）である。

【0045】そして、Pは図の下に矢印で示される様に1方向に予測符号化のされるP (Predictive-coded) フレームであり、またBは過去及び未来の双方向から動き予測ベクトルが求められて符号化されるB (Bidirectionally predictive-coded) フレームである。

【0046】このように、MPEG-2により符号化された画像は、3種類の性質を持つフレーム画像により構成されるが、例えばIフレームは15枚毎に配置されるが、Iフレームから、次のIフレームが開始される手前までの15枚のフレーム画像の集合をGOP (Group of Picture) と呼んでいる。

【0047】そのGOPが単位とされて画像が扱われるのは、このようにして符号化される画像の復号は、Iフレームを復号して後にP、及びBフレームの復号がなされるため、最初にIフレームの復号を行う必要がありGOPの先頭にIフレームが配置されるようになされているからである。

るからである。

【0048】そして、そのIフレームの復号がなされていないときは、その後のPフレーム、及びBフレームの復号が出来なく、入来されるデータの復号は次に供給されるGOPのIフレームの画像データを待って復号することとなる。

【0049】そのときのGOPの間隔は、 $N=15$ で構成されているときは15フレーム分、即ちNTSC (national television system committee color television system) のように毎秒30フレームであるビデオ信号の場合は0.5秒 ( $15/30=0.5$ ) おきに符号化されるGOPの信号を得てデコードされることとなる。

【0050】従って、例えばハードディスク63に記録されるデータを読み出してすぐ復号するためにはGOPの最初のデータをアクセスして得る必要があり、そのためにGOPの最初の部分が記録される位置を示す管理情報等を用い、読み出し時間の短縮を図るようにしている。

【0051】次に、このような読み出し時間の短縮を図るための管理情報、及び符号化信号の記録について述べる。前述の図1に示した映像信号記録再生装置40のハードディスク63には、MPEG-2エンコーダ53で符号化されて得られる符号化信号であるビットストリームはストリーム領域に、又そのビットストリームの符号化情報を含む管理情報は管理データ領域に、論理的に分けられて記録される。

【0052】そして、ストリーム領域に記録される符号化信号はMPEG-2エンコーダ53で符号化されて得られる可変長符号化された信号であり、単位時間あたりのビットストリームの長さ、即ちGOPを構成するデータのバイト数は設定された画質モードにより、及び符号化される映像が有する情報量に従って異なった値となる。

【0053】次に、そのような可変長符号化されたビットストリームのストリーム領域への記録について述べる。ハードディスク63の記録領域は、セクタと呼ばれる所定の記録容量毎に分割された単位毎に管理されるが、映像信号を記録するストリーム領域は、複数のセクタ、例えば1024セクタを1クラスタとし、クラスタ毎に分割されたビットストリームが記録される様になされている。

【0054】そのビットストリームはMPEG-2エンコーダ53により符号化され、ストリームアナライザ54を介してREC-FIFO55に一時記憶され、REC-FIFO55に一時記憶されるビットストリームの量がそのクラスタサイズを超えたときに、そのビットストリームをハードディスク63の所定のクラスタに書き込むようにする。

【0055】そして、書き込まれたビットストリームとそのクラスタの位置を示すアドレス等の管理情報は、い

わゆるファイル管理システムにより記録されるビットストリームの管理を行なうようにする。

【0056】次に、このようにして管理情報により管理されて記録を行う映像信号記録装置は、高品質な高速再生映像を得ることができるが、記録されたビットストリームよりその高速再生映像を得るための方法について述べる。

【0057】即ち、ここで前述の図2に示したMPEG-2方式により圧縮符号化して得られるビットストリームは、通常15フレーム毎にフレーム内符号化した1フレームの信号が配置されており、又このビットストリームの復号は1フレームから開始することとされている。

【0058】従って、このようなビットストリームでは、1フレームを得て復号し、P及びBフレームの復号を行わず次の1フレームの信号を復号するようにして1フレームのみの画像を得て表示すると15倍速の再生画像が得られる。

【0059】しかし、ストリーム領域に記録されるビットストリームはMPEG-2エンコーダ53より得られた信号がそのまま記録されているだけの場合は、符号化された信号のGOP (Group of Picture) の記録開始位置が特定されなく、従って1フレームの開始位置も不明(不定)である。

【0060】仮に、ビットストリームの圧縮符号化が固定レートであり、GOPのデータ量も一定量であれば、ビットストリームの先頭よりGOPサイズの整数倍の位置がGOPの開始位置である、としてGOPの開始点を特定することはできるが、圧縮符号化が可変長方式である場合はGOPの開始位置を特定することはできない。

【0061】そこで、ビットストリームの所定の位置を任意にアクセスするための情報を生成し、その生成された情報を基にビットストリーム再生の管理を行なうが、そのようなビットストリームの所定のデータが記録される位置、及び圧縮符号化時の動作パラメータ情報等を管理データとして生成する。

【0062】その管理データはストリームアナライザ54により生成されるが、そのストリームアナライザ54では供給されるビットストリームが解析され、解析して得られるパケット情報はマイコン57に供給される。

【0063】そのマイコン57に供給される情報は、GOP全体のバイト数、1フレームのバイト数、GOPのフレーム数、及び各Pフレームの終了位置までのバイト数などであり、マイコン57ではこれらの供給された情報を基にGOPに関する情報を含む管理データが生成され、生成された管理データは一時記憶メモリ58に一時記憶され、必要に応じてハードディスク63の管理データ領域に書き込まれるようになされている。

【0064】なお、これらのGOPに関する情報が、MPEG2エンコーダ53からヘッダ検出回路56に直接供給される場合は、その供給された情報を基にマイコン

57は上述の管理データを生成することが出来る。

【0065】次に、その管理データにより管理されてハードディスク63に記録されるビットストリームの構造について述べる。図3は、クラスタに書き込まれるビットストリームとGOPの関係を示したものである。

【0066】同図において、固定長であるクラスタ領域に可変長のデータであるGOPが記録される状態、及びそのクラスタ領域は複数のセクタにより構成されていることを示している。

【0067】そして、その連続して配置されるセクタには、LBA (Logical Block Address) と呼ばれる論理番号が連続して付されており、クラスタ中のセクタのLBAは連続している。

【0068】そのようにして、固定長のデータ領域であるクラスタにGOPの信号が記録されるが、そのGOPの符号量は可変長であるため、クラスタに記録されるGOPの数は不定となり、通常の場合はGOPのデータは複数のクラスタにわたって記録されることになる。

【0069】その、不定の位置に記録されるGOPの位置を容易にアクセスするためには、各GOPの記録位置情報が必要であり、一般にストリーム中のGOPの位置情報を管理情報として格納され、あるいはGOPヘッダに格納されるなどの方法が用いられているが、その格納方法について更に述べる。

【0070】この例では、GOP毎のフレーム数を15に設定してMPEG-2のエンコードを行っているため、映像信号のフレーム毎に1フレームのみをデコードして表示すると15倍速のサーチ映像が得られ、又フレーム毎に1GOPをスキップしながら1フレームのみをデコードすると30倍速サーチ映像が得られる等、15倍速以上の高速再生映像は1フレームのみの信号を復号して、高速映像信号とすることにより実現できる。

【0071】そこで、その1フレームの信号のみを得る方法に関し、通常の管理データはGOPの記録開始位置アドレス値を有しているため、そのアドレス値を基にGOPの信号を読み出し、GOPの最初の部分に格納される1フレームの信号をMPEG-2デコーダに供給して復号を行う。

【0072】そのようにして、連続して記録されたGOPのデータを読み出し、1フレームの画像を復号することにより15倍速の高速再生映像となるが、その場合のハードディスクの読み出し速度は、通常再生時の15倍の読み出し速度が必要となるため、ハードディスクは読み出し速度が高速である高価なものを使用することとなる。

【0073】そこで、管理情報にはGOP全体ではなくて1フレームのみの読み出しを行うための1フレームデータ量情報、又は1フレーム終端部情報を格納することとする。

【0074】その1フレームがGOPの中で占めるデー



タ量の割合は、GOPのフレーム数を15に設定するときには30%程度であるので、GOPの全データを読み出す場合に比し、1フレームのみのデータを読み出す場合の読み出し時間は約30%に短縮できる。

【0075】このように、管理情報に1フレームのみを読み出すための1フレームデータ量情報、又は1フレーム終端部情報を格納することにより、高速再生時のハードディスクの読み出し速度を低くすることができると共に、読み出して得られるデータを一時記憶するバッファメモリ71のアクセス速度、及びそのメモリ量を必要以上に大きくしなくてもよく、更にはMPEG-2デコーダ72が1フレーム以外のP、及びBフレームの画像を復号する、もしくはP、及びBフレームの画像を読み捨てる等のための不要な動作時間を削減することができる。

【0076】以上、15倍速の高速再生映像を得るための動作について述べたが、30倍速、ないしは45倍速の高速再生映像を得るときは、1つおきのGOP、又は2つおきのGOPより、同様にして1フレームのみの画像信号を得て復号することにより高速再生映像を得ることが出来、以下15の整数倍の高速再生映像を同様にして得ることができる。

【0077】そして、ここではMPEG-2により符号化される場合の1フレームに関する動作速度として述べたが、他の符号化方式により圧縮された画像データに関しては、その符号化された画像単位がフレーム内符号化画像と複数のフレーム間符号化画像とより構成されるような場合は、その画像単位よりフレーム内符号化された画像を読み出して復号することにより高速再生映像を得ることができるものである。

【0078】次に、15倍速未満の高速再生映像を得る方法についてGOPを構成するデータと共に述べる。図4は、そのGOPを構成するI、P、及びBの各フレーム画像と、それらの画像データ量の関係について模式的に示したものである。

【0079】同図において、GOPの最初に1フレームのデータが約30%の期間存在し、次に第1、及び第2のBフレームB1、B2、そして第1のPフレームP1、2つにおいて第2のPフレームP2の画像データが存在している。

【0080】ここで、1フレーム、P1フレーム、P2フレームの3つのフレーム画像データを読み出してデコードすると5倍速の再生映像を得ることが出来る。そして、そのような5倍速再生時には、P2フレームまでの画像データを読み込み、B5以下の残りの画像データは読み込む必要がなく、ハードディスク63は、その次に再生するGOPデータを読み込む。

【0081】従って、画像データの読み込み時間の短縮ができ、その時間短縮効果はMPEG-2デコーダ72の演算時間短縮効果にもなる。同様にして、7.5倍速

再生を行うときはI、及びP1の2フレームを読み出し、復号処理を行い、B3以降の画像データの読み込み、及び復号を省くことにより同様な動作を行なうことが出来る。

【0082】以上、GOP単位で記録される符号化信号の必要な部分を読み出し、復号して高速再生映像を得る方法について述べたが、そのような高速再生を行うためには記録されるGOPデータの最初の位置をアクセスし、データの読み出しを行う必要があるが、次にそのようなGOPの最初の位置をアクセスするための方法について述べる。

【0083】そのGOPの最初の位置のアクセスは管理情報のデータを得て行うが、この例で示す管理情報にはGOPを構成する画像データのフレーム数が格納されている。即ち、通常のGOPは15フレームの画像で構成されるが、例えばMPEG-2エンコーダ53に供給される映像信号にシーンチェンジがなされているときは、MPEG-2エンコーダ53はGOPを再構成するため、GOPのフレーム数は15未満となる。

【0084】このようにして、GOPのフレーム数が変化するような場合は、管理情報として記録される前述のGOPフレーム数情報を用いて正確な時間位置のGOPを得ることが出来る。

【0085】仮にGOPのフレーム数情報が得られないときは、GOP信号の全ての画像を復号することにより、全画像枚数情報を得、その全画像枚数情報より高速再生制御のための再生時間情報を得ることとなるため、前述のような読み出し時間、及び復号時間を短縮させた再生動作を行なうことが出来なくなる。

【0086】このようにして、管理情報にフレーム数情報を格納することにより高速再生を行うためのGOPの正確な時間情報を得ることができ、目的とするGOPのデータを格納するクラスタ領域をアクセスしながらその高速再生が行える。

【0087】そのGOPデータは、単一のクラスタに記録される他、2つのクラスタにまたがって、更にデータ量が大きなGOPの場合は3つのクラスタにまたがって記録されることとなる。

【0088】次に、そのような複数のクラスタにまたがって記録されるGOPデータの位置の示し方について述べる。ここに示した映像信号記録再生装置の例では、GOPは最大3個以下のクラスタに記録することとし、そのGOPの位置情報はクラスタ領域で特定するようにしている。

【0089】そのGOPの記録位置の特定は、GOPが記録される最初のクラスタにおいてはそのクラスタ番号と、そのクラスタの最初の位置からGOPが開始される位置までのオフセット位置情報により行い、そしてGOPデータが2つ目のクラスタに連続して記録されるときは2つ目のクラスタのクラスタ番号を、3つ目のクラスタ

タに連続して記録されるときは3つ目のクラスタのクラスタ番号を基にして行う。

【0090】このような、GOPが2つ目もしくは3つ目のクラスタにまたがって記録されるときは、それらのクラスタの先頭の位置から続くGOPのデータが記録されるため、クラスタの先頭からGOPまでのオフセット情報は1つ目のクラスタについてのみ指定されることとなる。

【0091】そして、GOPのデータが記録される最後のクラスタでは、書き込まれるデータはその先頭から開始され、そのデータの終了位置は管理情報に格納されるGOPのバイト数により決められる。又、再生時のGOPデータの読み込みは、通常再生などの場合はGOPの全フレーム画像のデータを、高速再生の場合は前述の様に1フレームのみ、P1フレームまでを、又はP2フレームまでを、等のように記録されたビットストリームの読み込み動作が行われる。

【0092】その読み込み動作は、GOPが複数のクラスタに分割されて記録される場合でも、ディスク上でそのクラスタが連続して記録されていれば、具体的にはそれぞれのセクタに付されるLBA (Logical Block Address) が連続していれば、各々のセクタに対するアクセス動作を行うことなく、連続する複数のセクタの読み出し処理を行なうことができる。

【0093】図5に、クラスタ番号とセクタ番号の関係を示す。同図において、1クラスタが5セクタで構成される場合のクラスタ番号とセクタ番号の関係を示したものであり(1)は連続するクラスタに対して付されるセクタ番号を、(2)は連続しないクラスタに対するセクタ番号の関係を示している。

【0094】(1)のようなクラスタ構造のアクセスはクラスタ3のみをアクセスしてセクタ11から25のデータを読み出すことができるが、(2)のような連続しないクラスタに記録されるデータを読み出すためにはクラスタ3、及びクラスタ6に対するアクセス動作が必要となる。

【0095】例えば、1クラスタが256セクタとされるようなハードディスクの場合は、1セクタから256セクタまでを一度の読み出し処理で記録されたデータを読み込むことができ、同じセクタ数のデータを読み込む場合、連続しないクラスタに記録される256セクタを読み込むときに例えば128セクタづつ2回に分けて読み込むよりも、256セクタを一度に読み込むときの方が読み出し処理速度を高くできる。

【0096】図6に、クラスタ領域にGOPデータを記録した状態を模式的に示す。同図において、クラスタnはセクタ21～25により、クラスタn+1はセクタ26～30よりなっており、そのセクタ23～28にGOPデータが記録されている。

【0097】このように複数のクラスタにGOPデータ

が記録される場合でも、その再生はクラスタnをアクセスし、オフセット値aで示されるセクタ21、22を読み飛ばし、セクタ23より再生を開始する。

【0098】そして、セクタ26はクラスタnのセクタ25に連続しているため、そのまま連続して再生できる。これとは反対に、連続しないクラスタにGOPデータが記録されているときはその不連続なGOPデータを連続するクラスタに再記録し、再生時間を短縮する方法があり、そのようなデータ整理の方法はコンピュータにおけるデフラグ処理と類似している。

【0099】そして、記録と消去が繰り返しなされたハードディスクに対するビットストリームの記録は、不連続な空き領域に対して行われることが多くあり、そのような場合はクラスタ単位で独立して記録位置を移動するなどにより、クラスタの並べ替え(デフラグ処理)ができるようにしてある。

【0100】そのクラスタの並べ替え処理は、クラスタの移動処理時に管理情報として記録されるGOP情報中のクラスタ番号だけを変えて行なうことができるものであり、並べ替え処理が容易にできると共に、この方法では管理情報として格納される情報量が少なくて済んでいる。

【0101】このようにして、GOP情報、及びそのアクセスのための数値情報は配列されたデータとして管理データ領域に書き込まれ、その書き込まれたデータは読み出されて、より高速にハードディスクに記録されるGOP情報、又はGOP情報の中の必要な画像情報を読み出し、高速再生などの動作をスムーズに行なうことができる。

【0102】以上、この実施例に示した管理情報に記録される符号化信号の情報はGOP全体のバイト数、1フレームのバイト数、GOPのフレーム数、及び各Pフレームの終了位置までのバイト数等の情報が格納されており、その情報を基にハードディスクにセクタ、及びクラスタ構造で記録される映像信号の高速再生を行う場合の例について述べた。

【0103】このようにして、記録、再生動作上重要な情報が管理情報として格納されて用いられるが、次にその管理情報、及び圧縮符号化されたビットストリームをハードディスクに書き込む時に生じるエラー処理について述べる。

【0104】まず、ビットストリームの書き込みエラー処理に関し、前述の図1に示した映像信号記録再生装置40でハードディスク63のビットストリーム記録領域にビットストリームを記録する際に生じるエラー信号はハードディスク63に内蔵される回路、又はハードディスク記録再生器61により検出されるが、そのようにしてエラー信号が検出されたときに行うデータ処理方法に関してである。

【0105】即ち、一般のコンピュータ装置における周

辺機器で、データの書き込み、読み出し時に生じるエラー処理は、記録した信号の再生時にエラーが生じたときにリトライを例えば10回行うなどによりエラー信号の含まれないデータの取得を試み、そのリトライでも正常な信号が得られないときはエラーメッセージを出して処理動作を停止する場合が多い。

【0106】そして、ハードディスクのリトライが繰り返されることによって録画すべきストリームが長い時間（例えば数秒から10数秒間）書き込み動作が出来なく、その間のデータは記録されずに捨てられてしまう、あるいはストリームがデコーダーに供給されないためにストリームの再生がその長い時間停止してしまうなどは好ましくないため、前述の図1に示す映像信号記録再生装置40においても、ストリーム領域のリードライトに関してはハードディスク63のリトライ動作回数を制限することにより、所定の時間内にエラー処理が終わらない場合にはそのハードディスクがエラー情報を出力するようにしている。

【0107】そのリトライ動作を制限しない場合は、RECFIFO55のオーバーフロー、及びバッファメモリ71のアンダーフロー状態が発生し、ビットストリームの記録や再生が破綻することとなり好ましくない。

【0108】そこで、ハードディスク63のストリーム領域における書き込み信号に誤りデータが含まれる、いわゆるライトエラーが生じた場合の処理について、以下に述べる。

【0109】ここで、ハードディスク63へのビットストリームの書き込みは前述のようにクラスタ単位で行われており、1クラスタは1024セクタであるときは、実際には256セクタ×4回の書き込みにより行われるが、それらの4回の書き込み処理の中の1回の処理でエラーが検出されるときは、そのクラスタ1個に記録されるビットストリーム全てがエラーであるとして処理される。

【0110】それは、ビットストリームの記録に関してはクラスタを論理的な単位として扱うからであり、特に使用頻度の高いハードディスクの場合、そのようなクラスタのライトエラーは生じ易くなっている。

【0111】そして、そのような使用頻度の高かったハードディスクを用いる記録、再生装置で時々、録画動作が終了してしまうのは致命的な欠陥となるので、仮に記録時にライトエラーが生じた場合でも、復帰処理により記録を再開するのが好ましい。

【0112】図7に、GOP信号がクラスタに正常に記録される状態を模式的に示す。同図において、クラスタ $n-1$ ～クラスタ $n+1$ にGOP $m$ ～GOP $m+3$ が正常に記録されているときの状態を示している。

【0113】図8に、ライトエラーが発生したときのクラスタに対するGOP信号の記録のされ方を模式的に示す。同図は、の時点においてライトエラーが生じた場

合について示したものであり、そのライトエラーに対するGOPデータの扱われ方について述べる。

【0114】即ち、クラスタ $n+1$ の記録中にライトエラーが発生するときは、そのクラスタ $n+1$ の領域に記録される全てのGOPデータはエラーとして扱われるため、この図の場合はGOP $m+1$ ～GOP $m+3$ のデータはエラーであるとされ、一時記憶メモリに一時記憶されている管理情報よりこれらのGOP情報の消去を行う。

【0115】そして、この場合は、RECFIFO55からそのエラーの原因となったクラスタにどれだけのデータが転送されたかを確定することができないため、この時点でRECFIFO55に一時記憶されているビットストリームの全データを消去し、その後新たなビットストリームのデータの一時記憶を開始する。

【0116】その信号処理の過程は次のようになる。

1) ストリームアナライザ54は、次のGOPの最初より、MPEG-2エンコーダ53から供給されるビットストリームのRECFIFO55への転送を停止する。

【0117】2) ストリームアナライザ54は、現在供給中であるGOPデータの次のGOPデータの最初より、ビットストリームをRECFIFO55に供給せずに、供給されたデータを消去する。

【0118】3) ストリームアナライザ54がビットストリームの消去開始を確認した後に、RECFIFO55に一時記憶されているデータを消去する。

【0119】4) 一時記憶メモリに記憶されているGOP情報は、ライトエラーしたクラスタの直前のクラスタに記録されたGOP情報までを正常として記憶したままとし、それ以降のGOPは無効とされるので該当するGOP情報を消去する。

【0120】5) ライトエラーしたクラスタに該当する管理情報に「使用禁止」マークを付し、以後の記録を禁止する。

【0121】6) ストリームアナライザ54は、次のGOPの最初のデータよりRECFIFO55にビットストリームの供給を開始する。

【0122】7) ライトエラーの生じた次のクラスタから書き込みが開始されるが、その記録が再開される最初のGOP情報に、「ここから新しい、不連続なGOPが始まる」ことを示す不連続データフラグを付加する。これらのデータ処理により、記録動作が復帰される。

【0123】図9に、このようにしてライトエラー復帰にともなうデータ処理のなされたGOPデータの記録状態を模式的に示す。同図において、クラスタ $n$ のGOP $m$ までが記録されており、その次のGOPの位置は空き状態とされ、ライトエラー復帰後のストリームはクラスタ $r+1$ の最初の位置よりGOP $q$ 以降のデータが記録されている。

ERROR: ioerror  
OFFENDING COMMAND: imagemask

# PATENT ABSTRACTS OF JAPAN

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## (54) RECORDING METHOD FOR VIDEO SIGNAL, AND VIDEO SIGNAL RECORDER

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide a video signal recorder that continues recording even on the occurrence of a recording error to a stream area and a recording error to a management data area in the case of recording a coded video signal to a random accessible recording medium.

SOLUTION: A coded video signal is recorded in a stream area of a recording medium 63 after a temporary storage means 55 temporarily stores a coded signal generated by a coder 53, when an error is detected in a recording medium, after the coded signal stored in the temporary storage means 55 is

deleted, the signal processing for recording is restarted, when a recording error caused in a management data area at recording of management data, after applying automatic replacement processing is applied to the error area, the coded signal in the temporary storage means 55 is deleted to restart recording signal processing thereby realizing the video signal recorder with a short recording interruption time.

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## LEGAL STATUS

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## CLAIMS

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[Claim(s)]

[Claim 1] It obtains as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. In

the record approach of the video signal which stores the obtained coded signal temporarily, reads the coded signal stored temporarily, and is recorded on the record medium in which random access is possible When an error signal is detected by the 1st step which detects the error signal produced when recording said coded signal on said record medium, and its 1st step The 2nd step which eliminates said coded signal stored temporarily, and the 3rd step which starts the memory of said coded signal supplied after elimination by the 2nd step, The 4th step which reads the signal stored temporarily by the 3rd step for said every predetermined image unit, The record approach of the video signal characterized by having at least the 5th step which records the signal for every predetermined image unit in which reading appearance was carried out by the 4th step on said record medium.

[Claim 2] It obtains as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. The management data signal which includes \*\*\*\* information in the obtained coded signal in order of record of \*\*\*\* encoded information and its coded signal is generated. In the record approach of the video signal which stores temporarily each of the generated management data signal and said coded signal, reads those signals stored temporarily, and is recorded on each record section of the record medium in which random access is possible When an error signal is detected by the 1st step which detects the error signal produced when recording said coded signal on said record medium, and its 1st step The 2nd step which eliminates said coded signal stored temporarily, and the 3rd step which stores said coded signal supplied temporarily after a coded signal is eliminated by the 2nd step, The 4th step which reads the signal stored temporarily by the 3rd step for said every predetermined image unit, By the 5th step which records the signal for every predetermined image unit in which reading appearance was carried out by the 4th step on said record medium, and said 5th step The predetermined image unit by which reading appearance was carried out first is the record approach of the video signal characterized by having at least the 6th step which records said management data signal containing the flag which shows that it is data of a discontinuous image unit on a record medium.

[Claim 3] While obtaining as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit and storing the obtained coded signal temporarily In the record approach of the video signal which generates the management data for recording the obtained coded signal on a record medium, and reproducing, and records the generated management data and said coded signal stored temporarily on the record medium in which random access is possible When an error signal is detected by the 1st step which detects the error signal produced when recording said management data on said record medium, and its 1st step The 2nd step which eliminates said coded signal stored temporarily while performing automatic change processing of management data writing, The 3rd step which stores said coded signal supplied temporarily after the automatic change processing by the 2nd step and elimination of a coded signal are made, The record approach of the video signal characterized by having at least the 4th step which reads the signal stored temporarily by the 3rd step for said every predetermined image unit, and the 5th step which records the signal in which reading appearance was carried out by the 4th step on said record medium.

[Claim 4] It obtains as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. In the record approach of the video signal which obtains record and the rate of a data error at the time of playback for the obtained coded signal as management data for every predetermined record section, and records said coded signal on the record section based on the obtained management data The 1st step to which said coded signal detects the non-operating state of the record by which predetermined time writing or read-out is not made, or playback to said record medium, When non-operating state is detected by the 1st step The 2nd step which inspects the rates of a data error at the time of record including the record section it was presupposed in the past that the rate of a data error was size, The record approach of the video signal characterized by having at least the 3rd step which generates said management data which considers the record section it was presupposed by the 2nd step that the rate of a data error was smallness as record



authorization.

[Claim 5] It obtains as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. In the video-signal recording device which stores the obtained coded signal temporarily for a memory means, reads the coded signal stored temporarily, and is recorded on the record medium in which random access is possible When an error signal is detected by an error signal detection means to detect the error signal produced when recording said coded signal on said record medium, and its error signal detection means A memory elimination means to eliminate said coded signal stored temporarily, and a memory means to start the memory of said coded signal supplied after elimination by the memory elimination means, the video-signal recording device characterized by providing and constituting a signal record means to record the signal which carries out reading appearance of the signal stored temporarily for the memory means for said every predetermined image unit, and is acquired by carrying out reading appearance on said record medium.

[Claim 6] It obtains as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. In the video-signal recording device which stores the obtained coded signal temporarily for a memory means, reads the coded signal stored temporarily, and is recorded on the record medium in which random access is possible An overflow detection means to supply an overflow signal when the storage capacity of the coded signal memorized by said memory means to have predetermined storage capacity is inspected and supply of the coded signal is made exceeding storage capacity, The supply signal means for stopping which suspends supply of the coded signal to said memory means when an overflow signal is supplied by the overflow detection means, It is the video-signal recording device characterized by providing and constituting a memory elimination means to eliminate the coded signal memorized by said memory means when an overflow signal is supplied by said overflow detection means.

[Claim 7] It obtains as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. The management data signal which includes \*\*\*\* information in the obtained

coded signal in order of record of \*\*\*\* encoded information and its coded signal is generated. In the video-signal recording device which stores temporarily each of the generated management data signal and said coded signal, reads those signals stored temporarily, and is recorded on each record section of the record medium in which random access is possible An overflow detection means to supply an overflow signal when the storage capacity of the coded signal memorized by said memory means to have predetermined storage capacity is inspected and supply of the coded signal is made exceeding storage capacity, A memory elimination means to eliminate the coded signal memorized by said memory means when an overflow signal is supplied by said overflow detection means, It is the video-signal recording device characterized by providing a management data generation means to generate said management data containing the flag which shows that said coded signal is started from a discontinuous image unit when an overflow signal is supplied by said overflow detection means, and constituting.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the record approach of the image which receives TV broadcast and is acquired, and the video signal which makes a sound signal the signal by which compression coding was carried out, and records it on record media, such as a hard disk, and a video-signal recording device.

[0002]

[Description of the Prior Art] Since the video-signal recording device using the record medium in which random access, such as a hard disk, is possible as a record medium has the short access time for record, it has the function of two or more TV programs being recorded simultaneously, and being able to

perform record and playback of a video signal simultaneously.

[0003] And the video-signal recording device which has such a simultaneous record regenerative function The cache record playback to which it can view and listen while carrying out the time shift of the program under broadcast continuously in the past from the present, And it has convenient record functions -- the groupie playback reproduced as fulfills the program under current record can do the program which started record in the past -- and it is thought that it will be introduced into a home from now on with VTR used as a conventional time shift machine.

[0004] And the monitor of the record signal in the conventional VTR is made as [ listen / to the direct monitor TV / to the signal for record supplied to VTR / supply, view and ], and although the monitor of the signal which the monitor image has in the middle of a record circuit is made, it cannot know whether it is in the abnormalities in image quality of how it is actually recorded on the record medium, and its record image, or the condition that record is not made according to a certain cause.

[0005] In the video-signal recording device which has a simultaneous record regenerative function to it, since the signal recorded while reproducing the image under record on real time can be checked, it can know then also about the nonconformity at the time of record, and has the description of being able to press down a record mistake to minimum.

[0006] Furthermore, when an image to view and listen again or the overlooked image is during record, continuing record, the function of the record performed using a hard disk -- it can view and listen to the past image by simple actuation -- and playback is a function convenient for a viewer, and PVR (personal video recorder) which carried such a record function is also developed.

[0007]

[Problem(s) to be Solved by the Invention] By the way, although the record which VTR does not have when the random access nature of a record medium is excellent, and the video-signal recording device which has a record regenerative function can be constituted from a video-signal recording device using a hard disk as a record medium Although the hard disk which is the

record medium has some technical problems since it is made to operate as a video-signal recording device which records the image data of the large quantity supplied continuously and the equipment is constituted when using what was developed as a peripheral device for computers. The typical thing is shown below.

[0008] First, when recording the encoded video signal and reproducing the recorded video signal. Although there is the need of writing in at the rate of predetermined, and reading also in order to display the encoded video signal which is divided and recorded on a logical sector or a cluster as a smooth video signal. Especially when it is going to acquire the high-speed playback image of the video signal, it responds to the reproduction speed. The writing of still a lot of coded signals, And it is necessary to read, read-out of a high-speed coded signal performs substantially playback of such a high-speed playback video signal to the hard disk which has the usual read-out rate which is not expensive, and the working speed for it needs to be improved.

[0009] And with record media, such as a hard disk, when an error signal may be contained in the video signal recorded under the effect of the defect in the signal recording surface etc. and the error signal arises, with the storage for the conventional computers, the retry actuation which acquires the regenerative signal with which an error signal is not contained is made by performing ten repeat playbacks, for example.

[0010] However, since the continuous read-out actuation is required in playback of a video signal, it is necessary to reduce the operating time for the error signal processing to the defect of a record medium, and to solve it preferably [ when viewing and listening to an image -- performing repeat record or playback actuation many times causes / of a video signal / a breakdown in a hard disk -- ].

[0011] Furthermore, although there is management data of the encoded video signal and its encoded video signal in the signal recorded on a record medium in a video-signal recording device, the degrees of the effect to the data error of these signals differ, and it is made to record by setting up a different field for each signal on a record medium.

[0012] Although the error processing takes long time amount, therefore a

record function is suspended especially when a write error arises in a management data record section, the art for resuming record is required after the error-processing termination, and the solution is called for.

[0013] Then, while this invention generates the coded signal which has sufficient reproduction speed also to high-speed playback of the recorded video signal in the recording device of a video signal using the record medium which was excellent in random access nature, such as a hard disk The record actuation which effect which a record function stops also to the error signal especially based on the defect of a medium cannot receive easily, And the approach of recording the signal with which two kinds of error resistance differs on a record medium, and the solution means about the configuration of the equipment for it are shown. While comparing record of the video signal using record media, such as a hard disk realized as an object for computers, with the record function which the conventional VTR has and having desirable records, such as simultaneous record playback and high-speed playback, and reproducing characteristics It is going to offer the record approach of a video signal of being hard to be influenced of the error signal which originates in the defect of a record medium and is produced, and the configuration of a video-signal recording device.

[0014]

[Means for Solving the Problem] The record approach of the video signal of this invention and a video-signal recording device consist of the following means of 1-7, in order to solve the above-mentioned technical problem.

Namely, [0015] 1) Obtain as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. In the record approach of the video signal which stores the obtained coded signal temporarily, reads the coded signal stored temporarily, and is recorded on the record medium in which random access is possible When an error signal is detected by the 1st step (63 61) which detects the error signal produced when recording said coded signal on said record medium, and its 1st step The 2nd step which eliminates said coded signal stored temporarily (57 55), The 3rd step which starts the memory of said coded signal supplied after the elimination actuation by the 2nd step (57, 54, 55), The 4th step which

reads the signal stored temporarily by the 3rd step for said every predetermined image unit (55 61), The record approach of the video signal characterized by having at least the 5th step (61 63) which records the signal for every predetermined image unit in which reading appearance was carried out by the 4th step on said record medium.

[0016] 2) Obtain as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. The management data signal which includes \*\*\*\* information in the obtained coded signal in order of record of \*\*\*\* encoded information and its coded signal is generated. In the record approach of the video signal which stores temporarily each of the generated management data signal and said coded signal, reads those signals stored temporarily, and is recorded on each record section of the record medium in which random access is possible When an error signal is detected by the 1st step (63 61) which detects the error signal produced when recording said coded signal on said record medium, and its 1st step The 2nd step which eliminates said coded signal stored temporarily (57 55), The 3rd step which stores said coded signal supplied temporarily after a coded signal is eliminated by the 2nd step (57, 54, 55), The 4th step which reads the signal stored temporarily by the 3rd step for said every predetermined image unit (55 61), By the 5th step (61 63) which records the signal for every predetermined image unit in which reading appearance was carried out by the 4th step on said record medium, and said 5th step The predetermined image unit by which reading appearance was carried out first is the record approach of the video signal characterized by having at least the 6th step (57, 58, 61, 63) which records said management data signal containing the flag which shows that it is data of a discontinuous image unit on a record medium.

[0017] 3) While obtaining as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit and storing the obtained coded signal temporarily In the record approach of the video signal which generates the management data for recording the obtained coded signal on a record medium, and reproducing, and records the generated management data and said coded signal stored temporarily on the

record medium in which random access is possible When an error signal is detected by the 1st step (63 61) which detects the error signal produced when recording said management data on said record medium, and its 1st step The 2nd step which eliminates said coded signal stored temporarily while performing automatic change processing of management data writing (63, 61, 57, 55), The 3rd step which stores said coded signal supplied temporarily after the automatic change processing by the 2nd step and elimination of a coded signal are made (57, 54, 55), The 4th step which reads the signal stored temporarily by the 3rd step for said every predetermined image unit (55 61), The record approach of the video signal characterized by having at least the 5th step (61 63) which records the signal in which reading appearance was carried out by the 4th step on said record medium.

[0018] 4) Obtain as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. In the record approach of the video signal which obtains record and the rate of a data error at the time of playback for the obtained coded signal as management data for every predetermined record section, and records said coded signal on the record section based on the obtained management data The 1st step to which said coded signal detects the non-operating state of the record by which predetermined time writing or read-out is not made, or playback to said record medium (65 57), When non-operating state is detected by the 1st step The 2nd step which inspects the rates of a data error at the time of record including the record section it was presupposed in the past that the rate of a data error was size (61 63), The record approach of the video signal characterized by having at least the 3rd step (57) which generates said management data which considers the record section it was presupposed by the 2nd step that the rate of a data error was smallness as record authorization.

[0019] 5) Obtain as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. In the video-signal recording device which stores the obtained coded signal temporarily for a memory means, reads the coded signal stored temporarily, and is recorded on the record medium in which random access is possible

When an error signal is detected by an error signal detection means (63 61) to detect the error signal produced when recording said coded signal on said record medium, and its error signal detection means A memory elimination means to eliminate said coded signal stored temporarily (57 55), A memory means to start the memory of said coded signal supplied after elimination by the memory elimination means (57, 54, 55), the video-signal recording device characterized by providing and constituting a signal record means (55, 61, 63) to record the signal which carries out reading appearance of the signal stored temporarily for the memory means for said every predetermined image unit, and is acquired by carrying out reading appearance on said record medium.

[0020] 6) Obtain as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. In the video-signal recording device which stores the obtained coded signal temporarily for a memory means, reads the coded signal stored temporarily, and is recorded on the record medium in which random access is possible An overflow detection means to supply an overflow signal when the storage capacity of the coded signal memorized by said memory means to have predetermined storage capacity is inspected and supply of the coded signal is made exceeding storage capacity (55 57), The supply signal means for stopping which suspends supply of the coded signal to said memory means when an overflow signal is supplied by the overflow detection means (57 54), It is the video-signal recording device characterized by providing and constituting a memory elimination means (57 55) to eliminate the coded signal memorized by said memory means when an overflow signal is supplied by said overflow detection means.

[0021] 7) Obtain as a coded signal to which compression coding of the video signal supplied was carried out for every predetermined image unit. The management data signal which includes \*\*\*\* information in the obtained coded signal in order of record of \*\*\*\* encoded information and its coded signal is generated. In the video-signal recording device which stores temporarily each of the generated management data signal and said coded signal, reads those signals stored temporarily, and is recorded on each record section of the record medium in which random access is possible An overflow



detection means to supply an overflow signal when the storage capacity of the coded signal memorized by said memory means to have predetermined storage capacity is inspected and supply of the coded signal is made exceeding storage capacity (55 57), A memory elimination means to eliminate the coded signal memorized by said memory means when an overflow signal is supplied by said overflow detection means (57 55), When an overflow signal is supplied by said overflow detection means, Said coded signal is a video-signal recording device characterized by providing and constituting a management data generation means (57) to generate said management data containing the flag which shows that it is started from a discontinuous image unit.

[0022]

[Embodiment of the Invention] The desirable example which contains the video-signal regenerative apparatus for reproducing the recorded signal hereafter about the record approach of the video signal of this invention and the gestalt of operation of a video-signal recording device is shown, and it explains. To drawing 1 , a video signal is recorded on the hard disk, the outline block diagram of the video-signal record regenerative apparatus to reproduce is shown in it, and it usually outlines about the actuation at the time of record and playback with the configuration.

[0023] As for the actuation which the video-signal record regenerative apparatus 40 shown in this drawing consists of the Records Department 50, the medium section 60, and the playback section 70, and a monitor TV 90 is connected to the playback section 70 by the cable, and is made to the Records Department 50 and the playback section 70, the content of actuation made by the viewer with remote control 95 is transmitted towards the playback section 70 by infrared radiation.

[0024] First, the Records Department 50 consists of the TV tuner 51, A/D converter 52, MPEG-2 encoder 53, the stream analyzer 54, REC-FIFO55, a header detector 56, a microcomputer 57, and memory memory 58.

[0025] And the playback section 70 consists of buffer memory 71, MPEG-2 decoder 72, OSD73, D/A converter 74, a microcomputer 76, memory memory 78, and a remote control interface 79 for the medium section 60 again from

the hard disk record regenerator 61, a hard disk 63, and the write-in read-out controller 65.

[0026] Next, it outlines about actuation of the video-signal record regenerative apparatus 40 constituted by this appearance. First, the video signal which the video signal of the receiving channel set up with remote control 95 etc. among the broadcasting electric-waves which carry out Iriki from an antenna is received, receives the TV tuner 51, and is acquired is supplied to A/D converter 52, is changed into a digital signal and supplied to MPEG-2 encoder 53.

[0027] In the MPEG-2 encoder 53, according to MPEG-2 (moving picture experts group -2) standard defined by ISO/IEC (International Organization for Standardization/International Electrotechnical Commission), compression coding of the supplied video signal is carried out, and the signal by which compression coding was carried out is supplied to the stream analyzer 54 and the below-mentioned header detector 56.

[0028] In the stream analyzer 54, the encoded information signal which the format of the signal by which compression coding was carried out is analyzed, analyzes, and is acquired, and the supplied coded signal are supplied to REC-FIFO55.

[0029] It is the circuit which REC-FIFO55 stores temporarily the input signal with which the signal for record (REC:recording) is supplied [ with which are supplied and it FIFO(first in first out )-operates ], and supplies that signal to the inputted order as an output signal, and the signal supplied from this circuit is supplied to the hard disk record regenerator 61.

[0030] In the hard disk record regenerator 61, the supplied signal is made into the signal divided for every sector size for recording on a hard disk 63, the divided signal is supplied to the hard disk 63 by which motion control is carried out with the write-in read-out controller 65, and the supplied signal is recorded on the predetermined sector field of the disc-like record medium which a hard disk 63 does not illustrate.

[0031] And from the signal encoded by the above-mentioned header detector 56 by MPEG-2, the encoded information in connection with the data configuration of GOP (Group of Picture) is supplied, and the supplied encoded

information is supplied to a microcomputer 57.

[0032] With the microcomputer 57, the hard disk management information (it may be hereafter described as management data) for performing smoothly record of the information in a hard disk 63 and playback based on the supplied encoded information is generated, the generated management information is stored temporarily in the memory memory 58, and the hard disk management information stored temporarily is suitably recorded on the predetermined field of a hard disk 63 through the hard disk record regenerator 61.

[0033] Thus, in the time of the video signal supplied and recorded being a signal recorded on other archive media, such as VTR, although the video signal and the above-mentioned hard disk management information of the channel received are recorded on a hard disk 63, when the signal is an analog signal, A/D converter 52 is supplied, the same processing is made, and the video signal is recorded on a hard disk 63.

[0034] Moreover, when the video signals recorded are signals beforehand encoded by methods, such as MPEG-2, such as for example, BS digital broadcasting and digital ground broadcast, the direct stream analyzer 54 and the header detector 56 are supplied without minding MPEG-2 encoder, the same signal processing is made, and the encoded signal is recorded on a hard disk 63.

[0035] In addition, when it has the function in which MPEG-2 encoder 53 can supply the encoded information about the configuration of GOP etc., or when encoded information, such as GOP, is supplied by auxiliary information etc. by digital broadcasting etc., in the header detector 56, the management information which contains encoded information based on the information is generated, and it may be made to supply the information to the header detector 56, and to be supplied to a microcomputer 57.

[0036] Thus, analog TV broadcast, digital television broadcasting, or the video signal recorded on other record media is made into the video signal by which compression coding was carried out, and that video signal is recorded on a hard disk 63 with management information.

[0037] Next, it outlines about playback actuation of the record signal of the

hard disk 63 recorded by carrying out in this way. First, when a playback carbon button is operated with remote control 95, the content of actuation is transmitted to the remote control interface 79 by the modulated infrared light line, and the content of actuation of a remote control key is supplied to a microcomputer 76.

[0038] From the microcomputer 76, the control signal generated according to the content of actuation writes in, the read-out control circuit 65 is supplied, a hard disk 63 is controlled by the write-in read-out controller 65, a hard disk 63 reads the signal of the specified part, and the signal by which reading appearance was carried out is supplied to the hard disk record regenerator 61.

[0039] In the hard disk record regenerator 61, magnification of a signal by which reading appearance was carried out from the hard disk 63, detection of the error signal by which the property was amended and reproduced, etc. are performed, and the signal with which such signal processing was made is supplied to buffer memory 71.

[0040] In buffer memory 71, reading appearance of the signal which the signal by which compression coding was carried out was stored temporarily, and was stored temporarily according to the demand from MPEG-2 decoder is carried out, and it is supplied to the MPEG-2 decoder 72.

[0041] In the MPEG-2 decoder 72, the supplied signal follows MPEG-2 criterion. It is decoded by the complementary approach that compression coding was carried out with the encoder 53. Multiplex [ of the status signal with which information is displayed on a display machine by OSD (On Screen Display)73 ] is carried out. the digital video signal which was decoded and was acquired is during cache rec/play if needed -- etc. -- The digital video signal with which multiplex [ of the status signal ] was carried out is supplied to D/A converter 74, and is changed into an analog video signal, and the changed analog video signal is supplied and displayed on a monitor TV 90.

[0042] In addition, multiplex [ of the content information of a display memorized by the signal currently stored in the Video RAM by which the status signal by which multiplex is carried out to OSD73 here is built in OSD73, and which is not illustrated, or the memory memory 78 ] is carried out to the video signal with which the status signal generated based on the

information which was supplied to OSD73 through the microcomputer 76, and was supplied to the OSD73 is supplied from MPEG-2 decoder 72, and it is displayed.

[0043] Thus, the video signal supplied is made into the signal by which the compression in a frame and a motion compensation technique are used and encoded with MPEG-2 method and by which inter-frame compression was carried out, and those signals are recorded on a hard disk 63. And although reading appearance of the signal recorded on the hard disk 63 is carried out and it is decoded by MPEG-2 decoder, the picture signal encoded by MPEG-2 method made by the appearance next is described.

[0044] The class of image treated with MPEG-2 method by drawing 2 is shown. In this drawing, although the identifier of I, B, and P is given to the frame image (picture) which constitutes a video signal and it is arranged in the direction of time amount, the I is the I (Intra-coded) frame (picture) with which coding in a frame is made.

[0045] And P is the P (Predictive-coded) frame which is shown by the arrow head under drawing and by which predicting coding is carried out in the one direction like, and B is the B (Bidirectionally predictive-coded) frame by which the bidirectional lost-motion prediction vector of the past and the future is searched for and encoded.

[0046] Thus, although the image encoded by MPEG-2 is constituted by the frame image with three kinds of properties, although I frames is arranged every 15 sheets, they is calling the set of 15 frame images from I frames to this side where the following I frames are started GOP (Group of Picture), for example.

[0047] It is because decode of the image encoded by carrying out that an image is treated the GOP being used as a unit in this way decodes I frames, and P and decode of B frames are made behind, so it is made as [ arrange / at the head of GOP / it is necessary to perform decode of I frames first, and / I frames ].

[0048] And when the decode of I frames is not made, decode of P frames of after that and B frames cannot be performed, and decode of the data by which Iriki is carried out will wait for and decode the image data of I frames of

GOP supplied to a degree.

[0049] When spacing of GOP at that time consists of  $N = 15$ , in the case of the video signal whose number is per second 30 like 15 frames (national television system committee color television system), i.e., NTSC, the signal of GOP encoded by every 0.5 seconds ( $15 / 30 = 0.5$ ) will be acquired, and it will be decoded.

[0050] therefore -- for example, he carries out reading appearance and is trying to aim at compaction of time amount using the management information which shows the location where it is necessary to access the data of the beginning of GOP and to obtain them in order to carry out reading appearance of the data recorded on a hard disk 63 and to decode them immediately, therefore the part of the beginning of GOP is recorded

[0051] Next, the management information for aiming at compaction of such read-out time amount and record of a coded signal are described. The management information in which the bit stream which is the coded signal which is encoded with MPEG-2 encoder 53 and obtained contains the encoded information of the bit stream to a stream field again is logically divided into a management data field by the hard disk 63 of the video-signal record regenerative apparatus 40 shown in above-mentioned drawing 1, and is recorded on it.

[0052] And the coded signal recorded on a stream field is a signal which is encoded with MPEG-2 encoder 53 and acquired and by which variable length coding was carried out, and the die length of the bit stream per unit time amount, i.e., the byte count of the data which constitute GOP, serves as a different value according to the amount of information which the set-up image quality mode and the image encoded have.

[0053] Next, record to the stream field of such a bit stream by which variable length coding was carried out is described. Although the record section of a hard disk 63 is managed for every unit divided for every predetermined storage capacity called a sector, the stream field which records a video signal makes one cluster two or more sectors, for example, 1024 sectors, and is made by the appearance on which the bit stream divided for every cluster is recorded.

[0054] The bit stream writes the bit stream in the predetermined cluster of a hard disk 63, when the amount of the bit stream which is encoded by MPEG-2 encoder 53, is stored temporarily through the stream analyzer 54 at REC-FIFO55, and is stored temporarily at REC-FIFO55 exceeds the cluster size.

[0055] And management information, such as the address which shows the location of the written-in bit stream and its cluster, is made to manage the bit stream recorded by the so-called file management system.

[0056] Next, although the video-signal recording apparatus which records by doing in this way and being managed by management information can acquire a quality high-speed playback image, it describes the approach for acquiring the high-speed playback image from the recorded bit stream.

[0057] That is, the signal of I frames which usually encoded in the frame the bit stream obtained here by carrying out compression coding with MPEG-2 method shown in above-mentioned drawing 2 every 15 frames is arranged, and it is supposed that decode of this bit stream is started from I frames.

[0058] Therefore, in such a bit stream, as I frames is obtained and decoded, P and decode of B frames are not performed but the signal of I frames as follows is decoded, if the image of only I frames is obtained and displayed, a 15X playback image will be obtained.

[0059] However, only for the case that the signal with which the bit stream recorded on a stream field was obtained from MPEG-2 encoder 53 is recorded as it is, the recording start location of GOP (Group of Picture) of the encoded signal is not pinpointed, therefore the starting position of I frames is also unknown (indeterminate).

[0060] Temporarily, if compression coding of a bit stream is a fixed rate and the amount of data of GOP is also a constant rate, from the head of a bit stream, it can suppose that the location of the integral multiple of GOP size is a starting position of GOP, and the start point of GOP can be specified, but when compression coding is a variable-length method, the starting position of GOP cannot be pinpointed.

[0061] Then, although the information for accessing the position of a bit stream at arbitration is generated and bit stream playback is managed based on the generated information, the location where the predetermined data of

such a bit stream are recorded, the operational-parameter information at the time of compression coding, etc. are generated as management data.

[0062] Although the management data is generated by the stream analyzer 54, in the stream analyzer 54, the packet information which the bit stream supplied is analyzed, analyzes and is acquired is supplied to a microcomputer 57.

[0063] The information supplied to the microcomputer 57 is the byte count of the whole GOP, the byte count of I frames, the frame number of GOP, a byte count to the termination location of P frames each, etc., and with the microcomputer 57, the management data which includes the information about GOP based on such supplied information is generated, and the generated management data is stored temporarily in the memory 58, and is made as [ write / in the management data field of a hard disk 63 / if needed ].

[0064] In addition, when the information about these GOP(s) is directly supplied to the header appearance circuit 56 from the MPEG 2 encoder 53, a microcomputer 57 can generate above-mentioned management data based on the supplied information.

[0065] Next, the structure of the bit stream which is managed with the management data and recorded on a hard disk 63 is described. Drawing 3 shows the relation between the bit stream written in a cluster, and GOP.

[0066] In this drawing, it is shown that the condition that GOP which is variable-length data is recorded on the cluster field which is a fixed length, and its cluster field are constituted by two or more sectors.

[0067] And the logical number called LBA (Logical Block Address) is continuously given to the sector arranged continuously, and LBA of the sector in a cluster is following it.

[0068] Although it is made such and the signal of GOP is recorded on the cluster which is a fixed-length data area, since the amount of signs of GOP is variable length, the number of GOP(s) recorded on a cluster becomes unfixed, and, in the usual case, the data of GOP will be recorded over two or more clusters.

[0069] Although the approach of each record positional information of GOP



being required, and the positional information of GOP in a stream being stored as management information generally, or being stored in a GOP header is used in order to access easily the location of GOP recorded on the location of the indeterminate, the storing approach is described further.

[0070] Since the frame number for every GOP is set as 15 and MPEG-2 are encoded in this example, If only I frames is decoded and displayed for every frame of a video signal, a 15X search image will be acquired. Moreover, if only I frames is decoded skipping 1GOP for every frame, a high-speed playback image 15X or more -- a 30X search image is acquired -- decodes the signal of only I frames, and can realize it by considering as a high-speed video signal.

[0071] Then, since the usual management data has the recording start location address value of GOP about the approach of acquiring only the signal of I frames, the signal of GOP is read based on the address value, and it decodes by supplying the signal of I frames stored in the part of the beginning of GOP to MPEG-2 decoder.

[0072] although it becomes a 15X high-speed playback image by making it such, carrying out reading appearance of the data of GOP recorded continuously, and decoding the image of I frames, the hard disk in that case carries out reading appearance, since [ 15 times / at the time of playback / as many as this ] reading appearance is carried out and a rate is needed, a rate will carry out reading appearance of the hard disk, and the expensive thing which has a high-speed rate will usually be used for it.

[0073] Then, suppose that the I frame amount-of-data information or I frame trailer information for performing not the whole GOP but read-out of only I frames to management information is stored.

[0074] Since the percentage of the amount of data which the I frames occupy in GOP is about 30% when setting the frame number of GOP as 15, it compares, when reading all the data of GOP, and the read-out time amount in the case of reading data of only I frames can be shortened to about 30%.

[0075] Thus, while being able to make low the read-out rate of the hard disk at the time of high-speed playback by storing the I frame amount-of-data information or I frame trailer information for reading only I frames to

management information The access rate of the buffer memory 71 which stores temporarily the data which can begin to be read, And it is not necessary to make the amount of memory large beyond the need, and MPEG-2 decoder 72 decodes P other than I frame, and the image of B frames further, or the unnecessary operating times for reading and throwing away P and the image of B frames etc. can be reduced.

[0076] As mentioned above, although the actuation for acquiring a 15X high-speed playback image was described When acquiring a high-speed playback image (30X or 45X) From GOP in every other one, or GOP in every two, by acquiring and decoding the picture signal of only I frames similarly, a high-speed playback image can be acquired and the high-speed playback image of the integral multiple of 15 can be acquired similarly below.

[0077] And although stated as working speed about I in the case of MPEG-2 encoding here, when the encoded image unit consists of a coded image in a frame, and two or more inter-frame coded images about the image data compressed by other coding methods, a high-speed playback image can be acquired by reading and decoding the image encoded in the frame from the image unit.

[0078] Next, how to acquire a less than 15X high-speed playback image is described with the data which constitute GOP. Drawing 4 shows typically each frame image of I, P, and B which constitute the GOP, and the relation of those image amounts of data.

[0079] this drawing -- setting -- the beginning of GOP -- data of I frames -- about 30% of period existence -- carrying out -- a degree -- the 1st and the 2nd -- B1, B-2, and the 1 or 2 P P 1st set B frames, and the 2nd image data of P frame P2 exists.

[0080] Here, if three I frame P one frame image data [ frame ] of P two frames is read and decoded, a 5X playback image can be acquired. And it is not necessary to read the image data to P2 frame at the time of such 5X playback, the remaining image data below B5 does not need to read into it, and a hard disk 63 reads into it the GOP data reproduced to the degree.

[0081] Therefore, compaction of the reading time amount of image data can be performed, and the time amount compaction effectiveness also turns into

the operation-time compaction effectiveness of MPEG-2 decoder 72. Similarly, when performing 7.5X playback, two frames, I and P1, can be read, decode processing can be performed, and same actuation can be performed by excluding reading of the image data after B3, and decode.

[0082] In the above, although it is necessary to access the location of the beginning of the GOP data recorded and to read data in order to perform such high-speed playback, although how to carry out reading appearance of the required part of the coded signal recorded per GOP, to decode it, and to acquire a high-speed playback image was described, the approach for next accessing such a location of the beginning of GOP is described.

[0083] Although access of that location of the beginning of GOP is performed by obtaining the data of management information, the frame number of the image data which constitutes GOP is stored in the management information shown in this example. That is, although the usual GOP consists of images of 15 frames, when the scene change is made by the video signal supplied, for example to MPEG-2 encoder 53, in order that MPEG-2 encoder 53 may reconfigure GOP, the frame number of GOP becomes less than 15.

[0084] Thus, when the frame number of GOP changes, GOP of an exact time amount location can be obtained using the above-mentioned GOP frame number information recorded as management information.

[0085] Since all image number-of-sheets information will be acquired and the playback hour entry for high-speed playback control will be acquired from all the image number-of-sheets information by decoding all the images of a GOP signal when the frame number information on GOP is not acquired temporarily, it becomes impossible to perform playback actuation which shortened the above read-out time amount and decode time amount.

[0086] Thus, the exact hour entry of GOP for performing high-speed playback by storing frame number information in management information can be acquired, and the high-speed playback can be performed, accessing the cluster field which stores the data of GOP made into the object.

[0087] It will be recorded on a single cluster, and also ranging over two clusters, the GOP data will be recorded ranging over three clusters, when it is GOP with the still bigger amount of data.

[0088] Next, how the location of the GOP data recorded ranging over such two or more clusters is shown is described. GOP decides to record on a maximum of three or less clusters, and he is trying to specify the positional information of GOP in a cluster field in the example of the video-signal record regenerative apparatus shown here.

[0089] In the first cluster on which, as for pinpointing of the record location of GOP, GOP is recorded The cluster number, The offset-value-position information to a location that GOP is started from the location of the beginning of the cluster performs. And when GOP data are continued and recorded on the 2nd cluster, and the 3rd cluster is followed in the cluster number of the 2nd cluster and it is recorded, it carries out based on the cluster number of the 3rd cluster.

[0090] When such GOP is recorded ranging over the 2nd or the 3rd cluster, since the data of GOP which continues from the location of the head of those clusters are recorded, the offset information from the head of a cluster to GOP will be specified only about the 1st cluster.

[0091] And in the cluster of the last on which the data of GOP are recorded, the data written in are started from the head and the termination location of the data is determined by the byte count of GOP stored in management information. Moreover, as for reading of the GOP data at the time of playback, in playback etc., I reading actuation of the bit stream on which even P1 frame was recorded like until P two frame etc. is usually performed as mentioned above, as for the case of high-speed playback of the data of all the frame images of GOP.

[0092] The reading actuation can perform read-out processing of two or more continuous sectors, without performing access actuation to each sector, if LBA (Logical Block Address) specifically given to each sector if the cluster is continuously recorded on the disk is continuing even when GOP is divided and recorded on two or more clusters.

[0093] The relation between a cluster number and a sector number is shown in drawing 5 . In this drawing, the relation of a cluster number and a sector number in case one cluster consists of 5 sectors is shown, and (1) shows the relation of the sector number to the cluster which (2) does not follow in the

sector number attached to a continuous cluster. [0094] Although access of cluster structure as shown in (1) can access only a cluster 3 and the data of sectors 11-25 can be read, in order to read the data recorded on a not continuous cluster as shown in (2), the access actuation to a cluster 3 and a cluster 6 is needed.

[0095] For example, when the data once recorded by read-out processing in from 1 sector to 256 sectors when it was the hard disk with which one cluster is made into 256 sectors can be read and it reads the data of the same number of sectors, the direction when reading 256 sector at once can make read-out processing speed high rather than it reads in 128 sectors [ every ] 2 steps when reading 256 sectors recorded on a not continuous cluster for example.

[0096] The condition of having recorded GOP data on drawing 6 to the cluster field is shown typically. In this drawing, in Cluster n, the cluster n+1 consists of sectors 26-30 by sectors 21-25, and GOP data are recorded on the sectors 23-28.

[0097] Thus, even when GOP data are recorded on two or more clusters, the playback accesses Cluster n and starts playback for the sectors 21 and 22 shown with the offset value a from a skip and a sector 23.

[0098] And since the sector 26 is following the sector 25 of Cluster n, it is continuously reproducible as it is. When GOP data are recorded on the cluster which does not follow this reversely, the discontinuous GOP data is re-recorded on a continuous cluster, there is the approach of shortening playback time amount, and the approach of such data reduction is similar with the defragmentation processing in a computer.

[0099] And record and record of the bit stream to the hard disk with which elimination was made repeatedly have many things performed to a discontinuous free area, and it can be made to perform rearrangement (defragmentation processing) of a cluster by moving a record location independently per cluster in such a case etc.

[0100] While being able to perform rearrangement processing of that cluster by changing only the cluster number in the GOP information recorded as management information at the time of migration processing of a cluster and

being able to perform rearrangement processing easily, there is little amount of information stored as management information, and it can be managed with this approach.

[0101] Thus, the numerical information for GOP information and its access is written in a management data field as arranged data, and reading appearance of the written-in data can be carried out, it can read the required image information in the GOP information recorded more on a high speed by the hard disk, or GOP information, and can operate high-speed playback etc. smoothly.

[0102] In the above, information, such as a byte count of the whole GOP, a byte count of I frames, a frame number of GOP, and a byte count to the termination location of P frames each, is stored, and the information on the coded signal recorded on the management information shown in this example described the example in the case of performing high-speed playback of the video signal recorded on a hard disk with a sector and cluster structure based on that information.

[0103] Thus, although important information is stored as management information on record and playback actuation and it is used, error processing produced when writing the management information and the bit stream by which compression coding was carried out in a hard disk next is described.

[0104] first, although the error signal produced in case a bit stream is recorded on the bit stream record section of a hard disk 63 about write error processing of a bit stream with the video-signal record regenerative apparatus 40 shown in above-mentioned drawing 1 is detected by the circuit built in a hard disk 63, or the hard disk record regenerator 61, it comes out about the data-processing approach performed when it is made such and an error signal is detected.

[0105] namely, the time of an error producing the writing of data, and sometimes produced error processing which carries out reading appearance with the peripheral device in a common computer apparatus at the time of playback of the recorded signal -- a retry -- for example, when a signal with normal attempt and its retry is not acquired in acquisition of the data with which an error signal is not contained by carrying out 10 times etc., an error

message is sent and processing actuation is suspended in many cases.

[0106] And time amount (for example, for several seconds to about ten seconds) write-in actuation with the long stream which should be recorded on videotape by repeating the retry of a hard disk cannot be performed. Since it will be thrown away or a stream is not supplied to a decoder, without being recorded, playback of a stream data in the meantime Since [ the ] it is not desirable for it to be long and to carry out a time amount halt etc., Also in the video-signal record regenerative apparatus 40 shown in above-mentioned drawing 1 , by restricting the count of retry actuation of a hard disk 63 about the read/write of a stream field When error processing does not finish in predetermined time amount, he is trying for the hard disk to output error information.

[0107] When not restricting the retry actuation, overflow of REC-FIFO55 and the underflow condition of buffer memory 71 will occur, record and playback of a bit stream will fail, and it is not desirable.

[0108] Then, processing in which error data are contained in the write-in signal in the stream field of a hard disk 63 when the so-called write error arises is described below.

[0109] Here, the writing of the bit stream to a hard disk 63 is performed per cluster as mentioned above, one cluster is actually performed by 256 sector x4 time writing, when it is 1024 sectors, but when an error is detected by one processing in those four write-in processings, it is processed noting that all the bit streams recorded on the one cluster are errors.

[0110] That is because a cluster is treated as a logical unit about record of a bit stream, and, in the case of a hard disk especially with high operating frequency, it is easy to produce the write error of such a cluster.

[0111] And it is desirable to resume record by return processing at the record using the hard disk which was expensive as for such operating frequency, and a regenerative apparatus, even when a write error arises temporarily at the time of record, since it becomes a fatal defect that image transcription actuation is sometimes completed.

[0112] The condition that a GOP signal is normally recorded on a cluster by drawing 7 is shown typically. In this drawing, the condition when GOPm-

GOPm +3 is normally recorded on the cluster n-1 - the cluster n+1 is shown.

[0113] How record of the GOP signal over a cluster when a write error occurs is carried out to drawing 8 is shown typically. This drawing shows the case where a write error arises at the event of \*\*, and describes how the GOP data to the write error are treated.

[0114] That is, since all the GOP data recorded on the field of that cluster n+1 are treated as an error when a write error occurs during record of a cluster n+1, in the case of this drawing, it is supposed that the data of GOPm+1- GOPm+3 are an error, and such GOP information is eliminated from the management information stored temporarily in memory memory.

[0115] And since it cannot decide the data of which were transmitted to the cluster which caused that error from REC-FIFO55 in this case, all the data of the bit stream stored temporarily at REC-FIFO55 at this event are eliminated, and the memory of the data of a new bit stream is started after that.

[0116] The process of the signal processing is as follows.

1) The stream analyzer 54 suspends the transfer to REC-FIFO55 of the bit stream supplied from MPEG-2 encoder 53 from the beginning of the next GOP.

[0117] 2) The stream analyzer 54 eliminates the supplied data from the beginning of the next GOP data of the GOP data which are [ current ] under supply, without supplying a bit stream to REC-FIFO55.

[0118] 3) After the stream analyzer 54 checks elimination initiation of a bit stream, eliminate the data stored temporarily at REC-FIFO55.

[0119] 4) The GOP information memorized by memory memory presupposes that even the GOP information recorded on the cluster in front of the cluster which carried out the write error has been memorized as normal, and GOP after it eliminates the GOP information which corresponds since it considers as an invalid.

[0120] 5) Give a "disable" mark to the management information applicable to the cluster which carried out the write error, and forbid future records.

[0121] 6) The stream analyzer 54 starts supply of a bit stream from the data of the beginning of the next GOP to REC-FIFO55.

[0122] 7) Although writing is started from the following cluster which the write



error produced, add the discontinuous data flag which shows what "discontinuous new GOP begins from here" to the first GOP information that the record is resumed.

Record actuation returns by these data processing.

[0123] The record condition of GOP data that did in this way and data processing accompanying a write error return was made by drawing 9 is shown typically. In this drawing, even GOPm of Cluster n is recorded, the location of the next GOP is made into idle status, and, as for the stream after a write error return, the data after GOPq are recorded from the location of the beginning of a cluster r+1.

[0124] And since the discontinuous data flag is given to the management information of GOPq, playback of the bit stream from this GOPq obtains the flag of GOP information "with which discontinuous new GOP begins from here", and starts decoding of a discontinuous bit stream.

[0125] Since a part is missing, this bit stream is made discontinuous [ PTM (pulse time modulation) ] and decoding of a bit stream is not sometimes normally performed here when this discontinuous data flag is not attached, in order to prevent such decoding that is not normal, this discontinuous data flag is required.

[0126] Thus, according to the approach shown in the above-mentioned example, compression coding of the video signal which receives analog TV broadcast and is acquired is carried out. Or it obtains as a coded signal to which compression coding of the video signal of receiving digital broadcasting which compression coding is carried out and is broadcast, and being supplied was carried out for every predetermined image unit. In the record approach of the video signal which stores the obtained coded signal temporarily, reads the coded signal stored temporarily, and is recorded on the record medium in which random access is possible When the coded signal recorded on the record medium is read, it faces detecting the error signal contained in the signal and an error signal is detected After eliminating said coded signal stored temporarily and eliminating the signal, in order to start the memory of the coded signal supplied again, to read the signal stored temporarily for every predetermined image unit and to record it on said record medium, The

cause of generating a data error is in the stream field which records a bit stream temporarily. The bit stream stored temporarily even when mismatching arose between the bit stream recorded on a stream field by the cause and the management information recorded on a management data field is eliminated. Behind Since signal processing for recording is started, when record actuation is interrupted by the generated error signal, the auto return of record actuation can be performed.

[0127] Moreover, when the coded signal recorded on the record medium is read as other effectiveness by the approach by this example, it faces detecting the error signal contained in that signal and an error signal is detected After eliminating said coded signal stored temporarily and eliminating the signal, while starting the memory of the coded signal supplied again, reading the signal stored temporarily for every predetermined image unit and recording it on said record medium Since he is trying to add the flag which shows that it is a discontinuous image unit to the image unit by which record was started again, The cause of generating a data error is in the stream field which records a bit stream temporarily. The bit stream stored temporarily even when mismatching arose between the bit stream recorded on a stream field by the cause and the management information recorded on a management data field is eliminated. Behind While being able to perform the auto return of record actuation when record actuation is interrupted by the generated error signal since signal processing for recording is started Since the flag which shows that it is an image unit discontinuous per first image with which the auto return was made is added, a regenerative apparatus can resume decode actuation normally also to a discontinuous image unit.

[0128] And according to the configuration shown in the above-mentioned example, compression coding of the video signal which receives analog TV broadcast and is acquired is carried out. Or it obtains as a coded signal to which compression coding of the video signal of receiving digital broadcasting which compression coding is carried out and is broadcast, and being supplied was carried out for every predetermined image unit. In the recording device of the video signal which stores the obtained coded signal temporarily, reads the coded signal stored temporarily, and is recorded on the record medium in

which random access is possible When the coded signal recorded on the record medium is read, it faces detecting the error signal contained in the signal and an error signal is detected After eliminating said coded signal stored temporarily and eliminating the signal, in order to start the memory of the coded signal supplied again, to read the signal stored temporarily for every predetermined image unit and to record it on said record medium, The cause of generating a data error is in the stream field which records a bit stream temporarily. The bit stream stored temporarily even when mismatching arose between the bit stream recorded on a stream field by the cause and the management information recorded on a management data field is eliminated. Behind Since signal processing for recording is started, when record actuation is interrupted by the generated error signal, the configuration of the video-signal recording device which can perform the auto return of record actuation can be performed.

[0129] When a write error occurred [ in / as mentioned above / the stream record section of a hard disk ] by a defect etc., after the data error was detected, predetermined signal processing was performed, and the solution approach was described -- subsequent record actuation can be resumed.

[0130] Next, the error handling of the management information recorded on a management data field is described. That is, a hard disk 63 is divided into the stream field which records the bit stream by which compression coding was carried out, and the management data field which records the management information for managing the stream, and those data are recorded on a different field.

[0131] In the case of the data recorded on a stream field, the error produced at the time of playback of a bit stream performs playback by the retry, but when error processing does not finish by the retry in predetermined time, an error outputs unsettled information and a hard disk continues playback of the following signal.

[0132] It is extent out of which a block error comes to a playback image, when some errors are included and reproduced by the data of a bit stream, and it is because it is supposed that there is little trouble on viewing and listening.

[0133] However, in the case of the management information recorded on a

management data field, when error data are contained in the management information, trouble -- management of a bit stream becomes impossible and playback of a \*\*\*\* bit stream becomes impossible etc. to it -- is large. Then, the read/write of a management data field decides to process error data with the error data-processing mode used for the usual computer.

[0134] And when actuation by the error data-processing mode is made, in order to secure the dependability of sufficient data, the read/write of a management data field is made as [ perform / further / it is carried out for usually passing also along the count of retry processing, and / automatic change processing of a data error field ].

[0135] It is made to be automatically made in change processing by the address information by which the automatic change processing specified and records the record section which does not produce a data error instead of the record section which a data error produces, and the change of the record section is recorded on the error data control field of a hard disk.

[0136] Therefore, since it becomes an error data-processing mode of operation including automatic change processing and the processing takes dozens of seconds when a write error arises during management data writing, the writing of a bit stream also becomes impossible in the meantime.

[0137] And in the example of the video-signal record regenerative apparatus 40 shown in above-mentioned drawing 1 , since record to the hard disk 63 of the bit stream stored temporarily at REC-FIFO55 is stopped, overflow of data will arise in the REC-FIFO55.

[0138] Thus, although a video-signal record regenerative apparatus will suspend record actuation, in the phase which the automatic change processing ended, it is desirable that the auto return of record actuation is made, and it states auto return processing of the record actuation below.

[0139] First, although the memory data of REC-FIFO55 are overflowed when automatic change processing is started, by detecting the overflow, it judges that the recording apparatus has not carried out normal actuation, and the same processing actuation as the time of write error generating of the above-mentioned bit stream is performed.

[0140] the restart of elimination of the GOP information by which the actuation

is made data elimination of a halt of data supply and \*\* stream analyzer 54 from \*\* stream analyzer 54 to REC-FIFO55, elimination of \*\*REC-FIFO55 are-recording data, and \*\* invalid, the check of \*\* auto return processing termination, and the bit stream supply to \*\*REC-FIFO55, discontinuous data flag addition to \*\* write-in restart GOP information, and \*\* -- it is made like.

[0141] Thus, although the overflowing bit stream and the bit stream under auto return processing are not recorded, record of the bit stream supplied after that is performed normally.

[0142] The 1st cause which the overflow produces is the case where it is based on the error signal produced to the above stream fields at the time of the writing of a coded signal.

[0143] and it is the case where the chart lasting time of a bit stream signal will run short, and REC-FIFO overflows as the 2nd cause by [ of the management data ] carrying out writing or reading appearance and performing processing repeatedly in the time of carrying out writing or reading appearance and an error signal sometimes arising to a management data field.

[0144] It is the case where an error signal arises working in simultaneous rec/play mode like for example, groupie record playback as the 3rd cause at the time of bit stream read-out by the side of playback, are the case where retry actuation is made etc., the time amount for stream record runs short as a result, and REC-FIFO overflows.

[0145] Since, as for the recording device, REC-FIFO will not perform normal actuation according to other causes the outside in the case of being represented by these overflow or when an underflow is carried out, it carries out to making actuation of stream record normalize by auto return processing.

[0146] And although the video signal supplied to dependability reservation of the data recorded on a management data field into the \*\*\*\* processing time is not recorded on videotape, least desirable actuation, such as image transcription interruption by which the image transcription after auto return processing is not made, is avoidable.

[0147] Thus, according to the example shown here, compression coding of the video signal which receives analog TV broadcast and is acquired is carried out. Or it obtains as a coded signal to which compression coding of

the video signal of receiving digital broadcasting which compression coding is carried out and is broadcast, and being supplied was carried out for every predetermined image unit. While storing the obtained coded signal temporarily, reading the coded signal stored temporarily and recording on the record medium in which random access is possible In the record approach of the video signal which also records the management information for managing the image unit recorded When the management information recorded on the record medium is read, an error signal is detected and an error signal is detected After eliminating said coded signal stored temporarily and eliminating the signal, in order to start the memory of the coded signal supplied again, to read the signal stored temporarily for every predetermined image unit and to record it on said record medium, The cause of generating a data error is in the management data field which records management information temporarily. The bit stream stored temporarily even when mismatching arose between the bit stream recorded on a stream field by the cause and the management information recorded on a management data field is eliminated. Behind Since signal processing for recording management information and a bit stream is started, when record actuation is interrupted by the generated error signal, the auto return of record actuation can be performed.

[0148] As mentioned above, although return processing of the image transcription actuation accompanying auto return processing of the write error in a management data field was described, such return processing is used also as the image transcription re-start process approach after the cause is restored at the time of a halt of the image transcription actuation by other causes.

[0149] According to the configuration which carried the approach shown in this example, compression coding of the video signal which receives analog TV broadcast and is acquired is carried out. Or it obtains as a coded signal to which compression coding of the video signal of receiving digital broadcasting which compression coding is carried out and is broadcast, and being supplied was carried out for every predetermined image unit. In the recording device of the video signal which memorizes the obtained coded signal for a memory means to have predetermined storage capacity, reads the coded signal stored

temporarily, and is recorded on the record medium in which random access is possible When overflow of a memory means is detected and overflow is detected by supervising the amount of signs of the coded signal stored temporarily for the memory means After eliminating said coded signal stored temporarily and eliminating the signal, in order to start the memory of the coded signal supplied again, to read the signal stored temporarily for every predetermined image unit and to record it on said record medium, When a failure arises in actuation of video-signal recording devices, such as a record data error in the nonconformity or the stream field of processing of the generation process of the bit stream for recording temporarily, and a stream signal As opposed to the mismatching of the bit stream recorded on the stream field which those failures become a cause and is produced, and the management information recorded on a management data field Since signal processing for eliminating the bit stream memorized by the memory means and later recording is started, when record actuation is interrupted according to the generated failure, the configuration of the video-signal recording device which can perform the auto return of record actuation can be performed.

[0150] And according to the configuration which carried the approach shown in this example, compression coding of the video signal which receives analog TV broadcast and is acquired is carried out. Or it obtains as a coded signal to which compression coding of the video signal of receiving digital broadcasting which compression coding is carried out and is broadcast, and being supplied was carried out for every predetermined image unit. In the recording device of the video signal which memorizes the obtained coded signal for a memory means to have predetermined storage capacity, reads the coded signal stored temporarily, and is recorded on the record medium in which random access is possible When overflow of a memory means is detected and overflow is detected by supervising the amount of signs of the coded signal stored temporarily for the memory means After eliminating said coded signal stored temporarily and eliminating the signal, while starting the memory of the coded signal supplied again, reading the signal stored temporarily for every predetermined image unit and recording it on said record medium In order to record the management data it is supposed that the signal with which again

record was started is a signal started as a discontinuous image unit on the record medium, When a failure arises in actuation of video-signal recording devices, such as a record data error in the nonconformity or the stream field of processing of the generation process of the bit stream for recording temporarily, and a stream signal As opposed to the mismatching of the bit stream recorded on the stream field which those failures become a cause and is produced, and the management information recorded on a management data field While being able to perform the auto return of record actuation when record actuation is interrupted according to the generated failure since signal processing for eliminating the bit stream memorized by the memory means and later recording is started Although decode actuation is normally started noting that decode of the signal with which the auto return was made and record was resumed is a coded signal started from the image unit which is the above-mentioned discontinuity, the configuration of the video-signal recording device which records the coded signal and management data for it can be performed.

[0151] By the way, since the larger possible one can lengthen chart lasting time, the capacity of the hard disk recorded on videotape by doing in this way is desirable. And since the auto return processing to an error sector field is made also in a bit stream record section, as for the field where auto return processing was made, considering as a recordable field is desirable.

[0152] That is, if an error occurs during record of a bit stream in a cluster as mentioned above, record of the signal after it will be forbidden, the cluster being used as a "disable", but even when an error produces the cluster made into the disable only with 1 sector for example, in 1024 sectors, let the whole cluster be a disable.

[0153] And it becomes the sector recordable [ a bit stream ] when the hard disk itself performs the automatic change which is the sector. However, the actuation is performed at the time of the standby which does not perform that the automatic change processing takes the time amount for several 10 seconds at the time of record of a bit stream for a certain reason, either, but omits record and playback actuation etc.

[0154] When read/write is performed to the cluster to which the disable mark



was given where an automatic change function is turned ON, and error detection is not made at the time of the automatic check actuation of a hard disk performed when the power source of equipment is switched on, the disable mark attached is removed, and the automatic change processing actuation enables record to the cluster field.

[0155] the error detection should do -- although an error may not have been detected by this read/write inspection with the condition that there is nothing when the automatic change of a sector was performed inside a hard disk or, the cluster which considered as the prohibition on record of a stream record section in any case, or the disable condition of a sector is canceled.

[0156] Thus, although automatic change processing is not performed during the rec/play of a bit stream, by performing automatic change processing in the standby condition that a power up or record, and playback are not performed, the sector of a hard disk or the record section of a cluster can be revived, and amplification of the storage capacity of a hard disk is made.

[0157] According to the approach shown in this example, compression coding of the video signal which receives analog TV broadcast and is acquired is carried out. Or it obtains as a coded signal to which compression coding of the video signal of receiving digital broadcasting which compression coding is carried out and is broadcast, and being supplied was carried out for every predetermined image unit. While recording the obtained coded signal on the record medium in which random access is possible In the record approach of the video signal which also records the management information for managing the image unit recorded When a power source is switched on, the non-operating state by which the writing to the record medium or read-out actuation is not made is detected and non-operating state is detected By inspecting the data errors at the time of record including the record section it was presupposed in the past that the rate of a data error was size, and considering the record section it is supposed that there is no data error as record authorization When the change processing of a record section considered as the prohibition on record in the past is already made, and when a data error stops arising in the field, since a record section is expandable, chart lasting time of a record medium can be lengthened.

[0158] In the above, the bit stream obtained by carrying out compression coding by MPEG-2 was recorded using the hard disk, and the solution approaches, such as revival processing after the signal record approach for performing smooth high-speed playback about the reproduced video-signal record regenerative apparatus, the approach of error processing for a stream record section, and error processing in an information data control field, and the solved configuration of equipment were described.

[0159] And the playback section 70 as a video-signal recording device with which the video-signal record regenerative apparatus 40 which makes one the function of record and playback in which those technical problems were solved consists of the Records Department 50 and the medium section 60 has the approach of constituting as a video-signal regenerative apparatus.

[0160] Furthermore, it can join together by a home network etc. and the equipment which installs those video-signal recording devices and video-signal regenerative apparatus in a different location, and is installed in those distant locations can be operated.

[0161] It is installed in domestic, the video-signal recording apparatus at that time being used as a home server, a video-signal regenerative apparatus is connected to the home server by the home network, and the video-signal regenerative apparatus is installed as two or more set top boxes for every chamber in which a monitor TV is installed.

[0162] In this case, that home server is constituted as bit stream sending-out equipment, and a set top box is constituted as a bit stream accepting station, and the video-signal information recorded on a hard disk performs both by the operating instructions from each part store through the set top box to which a user operates the record of a bit stream made into the object, and playback, and it views [ it is combined by high-speed wireless LAN or Home LAN, and / performing two-way communication ] and listens to the video signal supplied with Monitor TV.

[0163] Thus, it is also possible to constitute the network form visual system which the recording device and the playback section as a transmit terminal and an accepting station are installed in the distant location, two or more transmit terminals and two or more accepting stations are combined in a

network when operating unitedly by means of communications, and is operated.

[0164] Moreover, although the record medium used for the medium section of the recording apparatus described the hard disk as an example, as for a record medium, it is clear that it is applicable also to the recording apparatus using the record medium in which other random access, such as DVD of the medium in which rapid access is possible, for example, a magneto-optic disk, a RAM form, or RW form, and a semiconductor memory form record medium, is possible.

[0165] Furthermore, although the coding method of a video signal described MPEG-2 method as an example The approach the approach of compression coding applies not only this but coding in a frame to which it is commonly called Motion-JPEG, Or MPEG-4 method, MPEG-7 method, MPEG-21 method with which normalization will be started from now on, In addition, when recorded by the bit stream managed by management information in compression coding, such as a thing using the fractal compression technique, and decode processing, the video-signal recording device adapting the above-mentioned technique can be constituted.

[0166]

[Effect of the Invention] According to invention according to claim 1, when record actuation is interrupted by the error signal generated at the time of medium record, it is effective in the ability to offer the record approach of the video signal which can perform the auto return of record actuation.

[0167] Moreover, when record actuation is interrupted by the error signal generated at the time of medium record, while being able to perform the auto return of record actuation according to invention according to claim 2 Since the flag which shows that it is an image unit discontinuous per first image with which the auto return was made is added and recorded, a regenerative apparatus is effective in the ability to offer the record approach of the video signal it enabled it to resume normally in decode actuation also to a discontinuous image unit.

[0168] Moreover, according to invention according to claim 3, when record actuation is interrupted by the generated error signal, it is effective in the

ability to offer the record approach of the video signal which can perform the auto return of record actuation.

[0169] Moreover, when the change processing of a record section considered as the prohibition on record in the past is already made according to invention according to claim 4, and when a data error stops arising in the field, since a record section is expandable, it is effective in the ability to offer the record approach of the video signal which lengthens chart lasting time of a record medium.

[0170] Moreover, according to invention according to claim 5, when record actuation is interrupted by the generated error signal, it is effective in the ability to offer the configuration of the video-signal recording device which can perform the auto return of record actuation.

[0171] Moreover, according to invention according to claim 6, when record actuation is interrupted according to the generated failure, it is effective in the ability to offer the configuration of the video-signal recording device which can perform the auto return of record actuation.

[0172] Moreover, according to invention according to claim 7, when record actuation is interrupted according to the generated failure, the record signal with which record is resumed after interruption is effective in the ability to offer the configuration of a video-signal recording device recordable as a signal which can perform playback and decode normally.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the video-signal record regenerative apparatus concerning the example of the video-signal recording apparatus of this invention.

[Drawing 2] It is drawing having shown the structure of the frame signal which a motion compensation is made by MPEG-2 method and encoded.

[Drawing 3] It is drawing having shown the relation between the bit stream written in the cluster concerning the example of this invention, and GOP.

[Drawing 4] They are each frame image of I, P, and B which constitute GOP concerning the example of this invention, and drawing having shown the relation of those image amounts of data.

[Drawing 5] It is drawing having shown the relation of the cluster number and sector number of a record section concerning the example of this invention.

[Drawing 6] It is drawing having shown the condition of having recorded GOP data on the cluster field concerning the example of this invention.

[Drawing 7] The GOP signal concerning the example of this invention is drawing having shown the condition of being normally recorded on a cluster.

[Drawing 8] It is drawing having shown how record of the GOP signal over a cluster when the write error concerning the example of this invention occurs was carried out.

[Drawing 9] It is drawing having shown the record condition of the GOP data accompanying the write error return concerning the example of this invention.

[Description of Notations]

40 Video-Signal Record Regenerative Apparatus

50 Records Department

51 TV Tuner

52 A/D Converter

53 MPEG-2 Encoder

54 Stream Analyzer

55 REC-FIFO

56 Header Detector

57 Microcomputer

58 Memory Memory

60 Medium Section

61 Hard Disk Record Regenerator

63 Hard Disk

65 Write-in Read-out Controller

70 Playback Section

71 Buffer Memory

72 MPEG-2 Decoder

73 OSD

74 D/A Converter

76 Microcomputer

78 Memory Memory

79 Remote Control Interface

90 Monitor TV

95 Remote Control

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